-4310-227-15

TM 5-4310-227-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT
GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL

COMPRESSOR, RECIPROCATING: AIR; GASOLINE ENGINE; 15 CFM, 175 PSI; RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG–458–ENG–1) FSN 4310–861–9818 RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG–458–ENG–2) FSN 4310–075–5251 RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG–458–ENG–3) FSN 4310–965–1197 BASE MOUNTED FOR MOUNTING ON ORD TRAILER WINTERIZED (CHAMPION PNEUMATIC MODEL BMW–452–ENG) FSN 4310–861–9819 BASE MOUNTED; WINTERIZED (CHAMPION PNEUMATIC MODEL BMW–452–ENG–1) FSN 4310–088–5342

This copy is a reprint which includes current pages from Changes 2 and 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

7 OCT 66

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*TM 5-4310-227-15
C 2

Change }
No. 2 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. *7 July 1972*

Operator, Organizational, Direct Support, and General Support and Depot Maintenance Manual
COMPRESSOR, RECIPROCATING: AIR; GASOLINE ENGINE; 15 CFM, 175 PSI; RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-1) FSN 4310-861-9818; RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-2) FSN 4310-075-5251; RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-3) FSN 4310-965-1197; BASE MOUNTED FOR MOUNTING ON ORD TRAILER, WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG) FSN 4310-861-9819; BASE MOUNTED, WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG-1) FSN 4310-088-5342

TM 5-4310-227-15, 7 October 1966 is changed as follows:

Page ii. APPENDIX B is changed to read as follows:

APPENDIX B. BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Page 1-1. Paragraph 1-1c is superseded as follows:

c. *Reporting of Equipment Publication Improvements.* The reporting of errors, omissions, and recommendations for improving this publication by the individual user should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to, Commanding General U.S. Army Mobility Equipment Command ATTN: AMSME-MPP. 4300 Goodfellow Blvd. St. Louis Mo. 63120.

Page B-1. Appendix B is superseded as follows:

APPENDIX B
BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the compressor, and required by the crew/operator for operation, installation, or operator's maintenance.

2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List — Section II. "Not Applicable".

***This change supersedes C 1, 17 July 1968.**

b. Items Troop Installed or Authorized List — Section III. A list, in alphabetical sequence of items which at the descretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List Section II, and Items Troop Installed or Authorized Section III.

a. Source, Maintenance, and Recoverability Code (S)(SMR):

(1) Source code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts, special tools and test equipment supplied from GSA/DSA or Army supply system and authorized for use at indicated maintenance levels.

(2) Maintenance code, indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

C Crew/Operator

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which are normally furnished by supply on an exchange basis.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished With Equipment (BIIL only). This column indicates the quantity of an item furnished with the equipment.

f. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

g. Illustration (BIIL only). This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration in which the item is shown.

(2) Item Number. Indicates the callout number used to reference the item in the illustration.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description			(4) Unit of meas	(5) Qty auth
			Ref. No. & Mfr code	Usable on code		
PC	7520-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUAL			EA	1
PC	4210-555-8837	EXTINGUISHER, FIRE			EA	1

By Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, U.S. Army
Acting Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A, (qty rqr block no. 18) Organizational maintenance requirements for Air Compressors: 15 CFM.

Changes in Force: C 2 and C 3

TM 5-4310-227-15
C 3

Change
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *28 June 1974*

Operator's Organizational, Direct Support, and General Support, and Depot Maintenance Manual

COMPRESSOR, RECIPROCATING, POWER-DRIVEN, AIR; GASOLINE ENGINE;

15 CFM, 175 PSI; CHAMPION PNEUMATIC MODELS; RECEIVER MOUNTED

(OEG-458-ENG-1) FSN 4310-861-9818
(OEG-458-ENG-2) FSN 4310-075-5251
(OEG-458-ENG-3) FSN 4310-965-1197

WINTERIZED; BASE MOUNTED FOR TRAILER MOUNTING

(BMW-452-ENG) FSN 4310-861-9819
(BMW-452-ENG-1) FSN 4310-088-5342

TM 5-4310-227-15, 7 October 1966, is changed as follows:

The title is changed to read as shown above.
Reverse of Cover, add to Safety Precautions:

WARNING

This compressor is NOT SUITABLE for the supply of air for charging cylinders with BREATHABLE AIR.

WARNING

Operation of this equipment presents a NOISE HAZARD to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear earmuffs or ear plugs which were fitted by a trained professional.

Page 1-1. Paragraph 1-1c, lines 6 through 9 are changed to read: Commander, U.S. Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Boulevard, St. Louis, MO. 63120.

Page 2-2. Paragraph 2-7d is added:

d. Noise Hazard Warning Signs. Signs conforming to provisions of AR 385-30 will be erected in the area to provide notification of NOISE HAZARD in accordance with TB MED-251. The signs should read:

WARNING

NOISE HAZARD EQUIPMENT.
HEARING PROTECTION REQUIRED.

Page 2-13, paragraph 2-25, add:

WARNING

Operation of this equipment presents a NOISE HAZARD to personnel in the area. Wear earmuffs or ear plugs which were fitted by a trained professional.

WARNING

This compressor is NOT SUITABLE for the supply of air for charging cylinders with BREATHABLE AIR.

Page 3-1, paragraph 3-6c, add:

WARNING

Dry cleaning solvent, PD-680, used for cleaning is a POTENTIALLY HAZARDOUS CHEMICAL. Do not use near open flame. Flash point of solvent is 100F 138F.

Page 3-5, paragraph 3-6. Subparagraph *f* is added as follows:

f. Fuel Filter Service. Service the fuel filter as described on figure 3-3.1.

Figure 3-3.1 is added as follows.

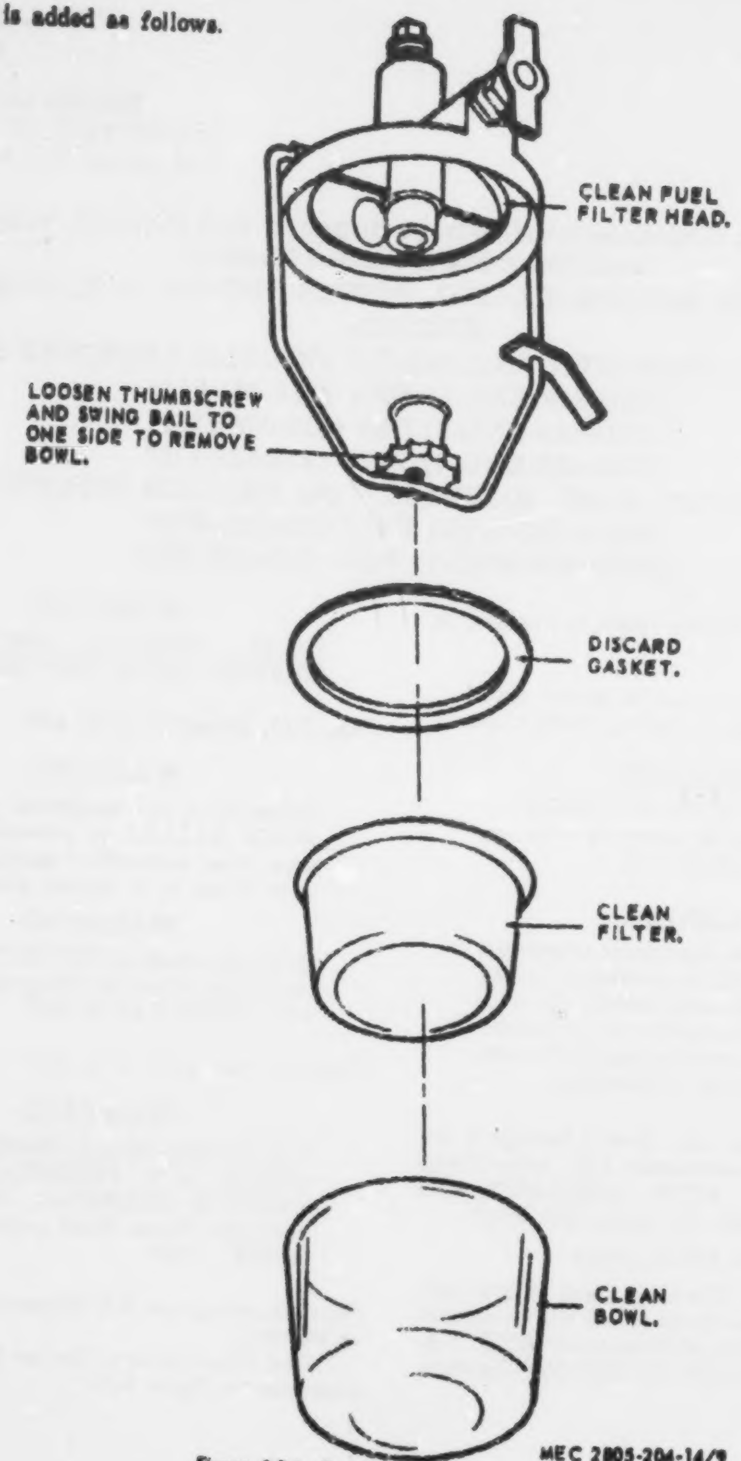

Figure 3-3.1. Fuel filter service.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A (qty rqr block No. 18), Organizational maintenance requirements for Air Compressors 15 CFM.

*TM 5-4310-227-15

TECHNICAL MANUAL
No. 5-4310-227-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *7 October 1966*

COMPRESSOR, RECIPROCATING: AIR; GASOLINE ENGINE; 15 CFM, 175 PSI; RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-1) FSN 4310-861-9818 RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-2) FSN 4310-075-5251 RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-3) FSN 4310-965-1197 BASE MOUNTED FOR MOUNTING ON ORD TRAILER WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG) FSN 4310-861-9819 BASE MOUNTED; WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG-1) FSN 4310-088-5342

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***This manual supersedes TM 5-4310-227-15, 17 January 1964, including C 1, 11 August 1965, and C 2, 18 January 1966.**

		Paragraph	Page
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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual is published for the use of personnel to whom the Champion Pneumatic Models OEG-458-ENG-1, OEG-458-FNG-2, OEG-458-ENG-3, BMW-452-ENG, and BMW-452-ENG-1 air compressors are issued. Chapters 1 through 3 provide information on the operation, daily preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapter 4 provides information for direct and general support and depot maintenance.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized the operator of this equipment and the maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart.

c. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting discrepancies and recommendations for improving this equipment publication. The form will be completed by the individual using the manual and forwarded direct to Commanding General, U. S. Army Mobility Equipment Center, ATTN: SMOME-MPD, 4300 Goodfellow Boulevard, St. Louis, Mo., 63120.

d. Report all equipment improvement recommendations as prescribed by TM 38-750.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to the operator and organizational maintenance, refer to TM 38-750.

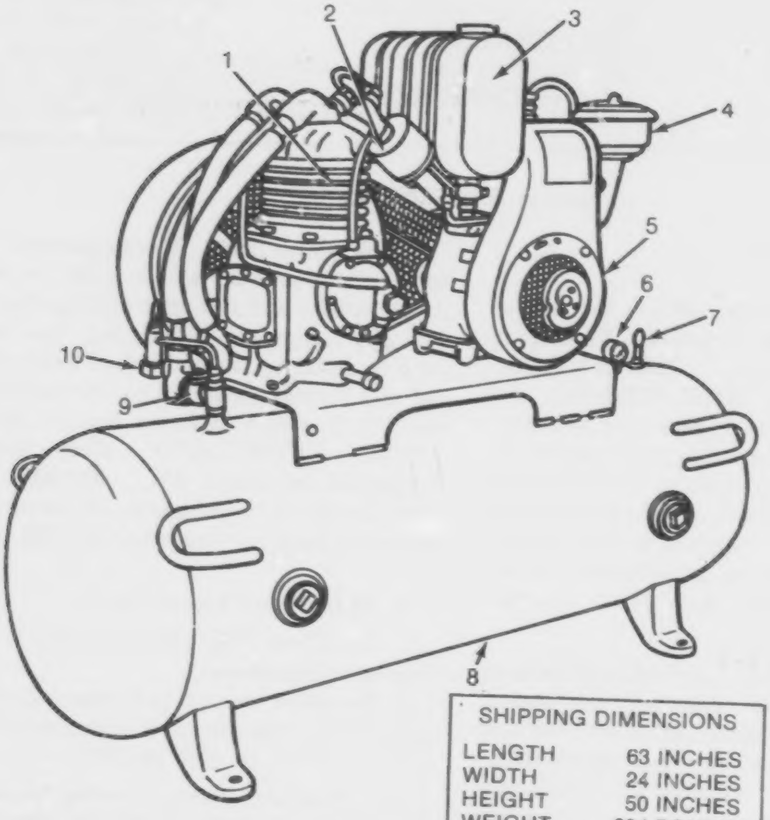
Note. Applicable forms, excluding standard Form 46 which is carried by the operator, will be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

1-3. Description

a. General. The champion air compressor, Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3 are portable, foot mounted, belt driven units (figs. 1-1, 1-2, 1-3, 1-4, and 1-5). The compressor assembly and gasoline engine are mounted on a platform welded to the air receiver tank. Model BMW-452-ENG is base mounted for mounting on a trailer (figs. 1-6 and 1-7. Model BMW-452-ENG-1 is base mounted. The latter two models are winterized. All five models are driven by a gasoline engine, and are designed to produce 15 cubic feet per minute (cfm) at 175 pounds per square inch (psi) of compressed air.

b. Gasoline Engines. The gasoline engine for models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1 is a Wisconsin Model MAENLD. The engine is a four-cycle, one-cylinder, L-head, air-cooled unit. The governed speed is 2,625 revolutions per minute (rpm). The gasoline engine for Model OEG-458-ENG-3 is a Military Standard Model 4A032-1. Complete data on this engine is contained in TM 5-2805-203-14.



SHIPPING DIMENSIONS	
LENGTH	63 INCHES
WIDTH	24 INCHES
HEIGHT	50 INCHES
WEIGHT	604 POUNDS

1 Air compressor
2 Compressor air cleaner
3 Fuel tank
4 Engine air cleaner
5 Engine
6 Pressure gage
7 Safety valve
8 Air receiver tank
9 Check valve
10 Unloader valve

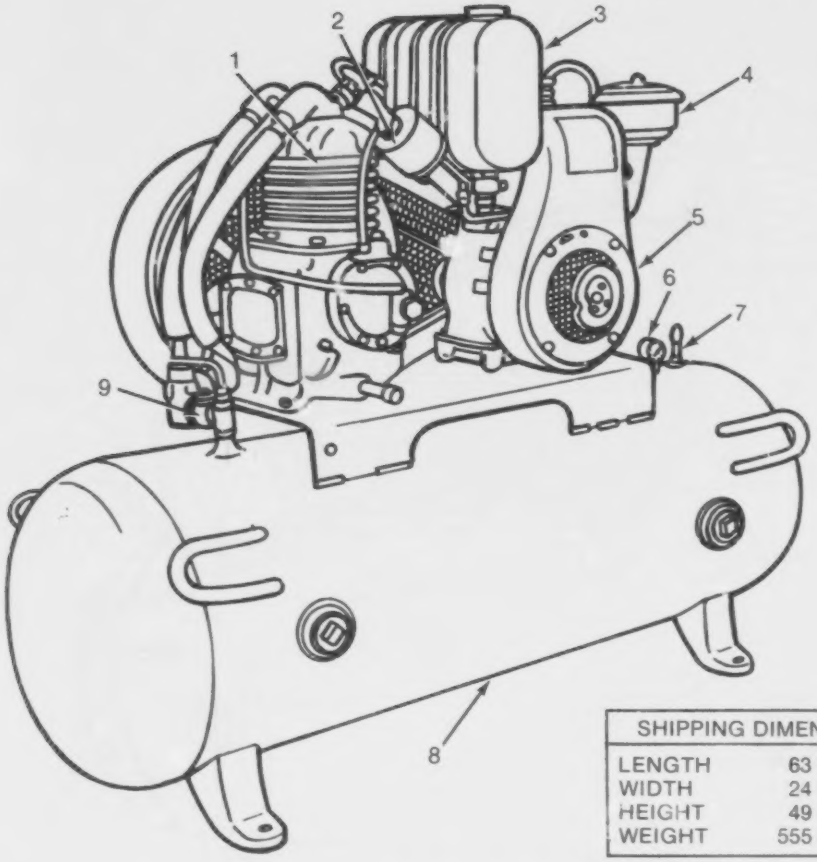
Figure 1-1. Air compressor (model OEG-458-ENG-1) left front, three-quarter view.

c. *Compressor Assembly.* The Champion compressor assembly is an air-cooled, 2-stage, vertical, reciprocating pump that delivers 15 cfm at 175 psi to the air receiver tank. All models operate at 690 rpm.

d. *Air Receiver Tank.*

(1) The air receiver tank, models OEG-458-ENG-1, OEG-458-ENG-2 and OEG-458-ENG-3 is the horizontal type supported on 4 steel feet. It has a capacity of 10.7 cu ft (cubic feet) and a maximum working pressure of 200 psi.

(2) The air receiver tank, models BMW-452-ENG and BMW-452-ENG-1, is mounted on the platform at the front of the unit. Each has a capacity of 2.673 cubic feet.



SHIPPING DIMENSIONS	
LENGTH	63 INCHES
WIDTH	24 INCHES
HEIGHT	49 INCHES
WEIGHT	555 POUNDS

1 Air compressor
2 Compressor air cleaner
3 Fuel tank
4 Engine air cleaner
5 Engine
6 Pressure gage
7 Safety valve
8 Air receiver tank
9 Check valve

Figure 1-2. Air compressor (model OEG-458-ENG-2) left front, three-quarter view.

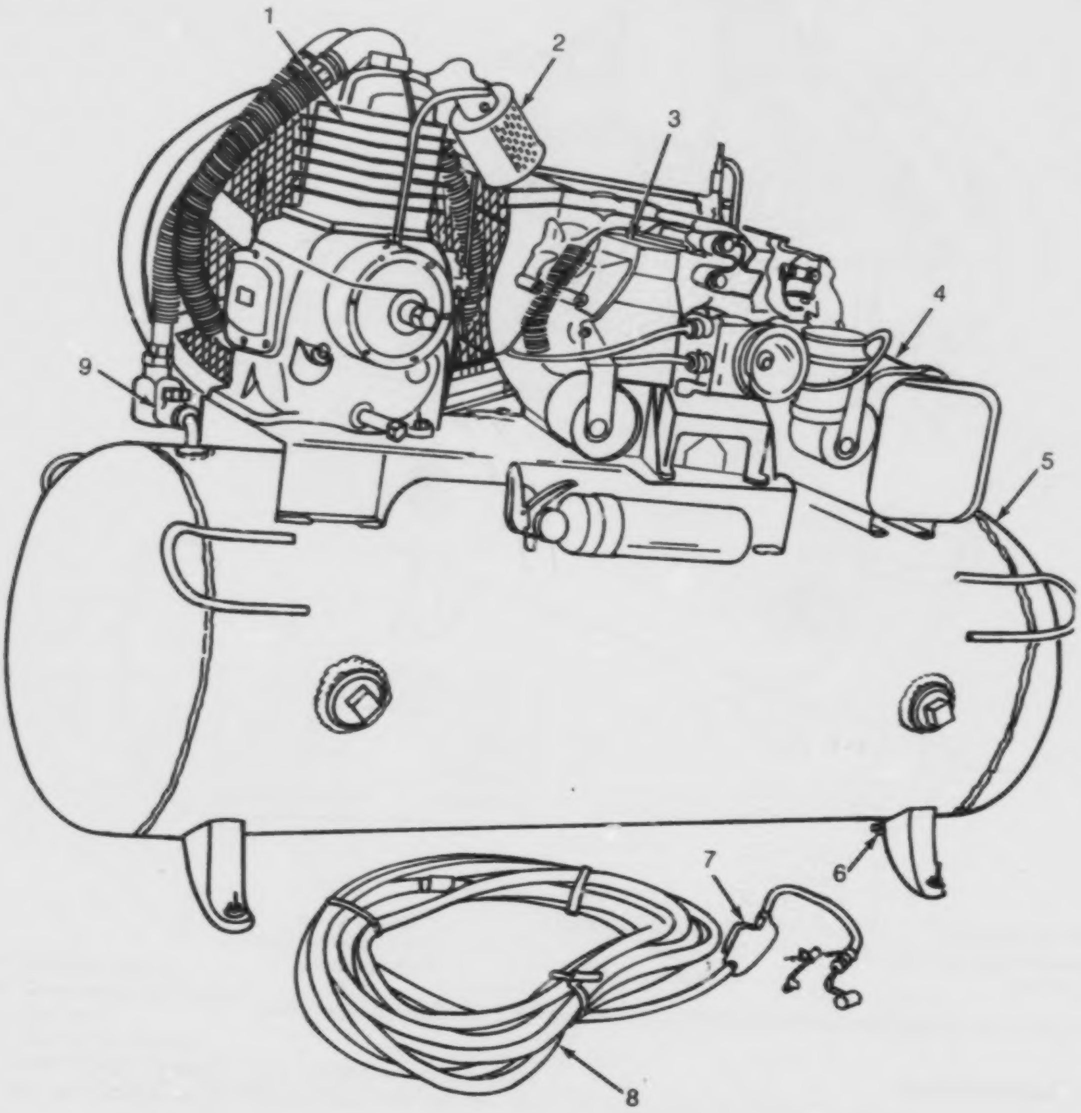
1–4. Identification

a. The Corps of Engineers identification plate for models OEG–458–ENG–1, OEG–458–ENG–2 and OEG–458–ENG–3 specifies the name of the manufacturer, make, model number, date of manufacture, serial number, and Federal stock number of the air compressor. It is located on the left side of the air receiver platform.

b. The Corps of Engineers identification plate for models BMW–452–ENG and BMW–452–ENG–1 specifies the name of the manufacturer, make, model number, date of manufacture, serial number, and Federal stock number of the air compressor. It is located on the outside of the instrument panel door.

c. The compressor identification plate specifies the name of the manufacturer, and the model and serial number of the air compressor. The plate is mounted on the governor housing of the compressor.

d. The gasoline engine identification plate includes the engine manufacturer, model number, serial number, lubrication instructions, and starting and stopping instructions. The plate is mounted on the left side of the engine.



1 Air compressor
2 Compressor air cleaner
3 Engine

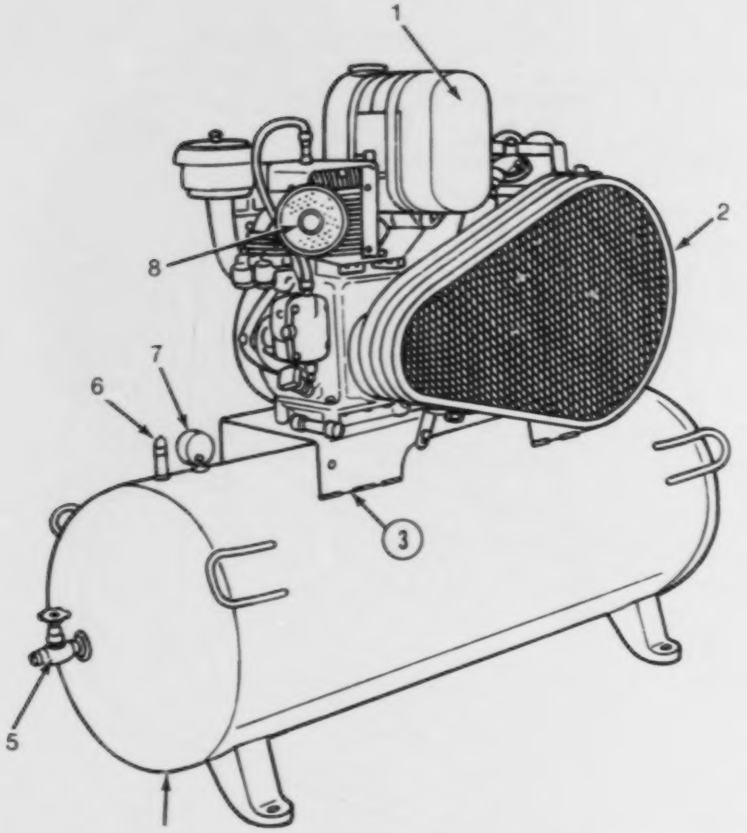
4 Fuel tank
5 Air receiver tank
6 Draincock

7 Inflator gage
8 Hose
9 Check valve

Figure 1-3. Air compressor (model OEG-458-ENG-3) left front, three-quarter view.

1–5. Differences in Models

This manual covers the champion air compressors, Models OEG–458–ENG–1, OEG–458–ENG–2, OEG–458–ENG–3, BMW–452–ENG, and BMW–452–ENG–1. Models OEG–458–ENG–1, OEG–458–ENG–2, and OEG–458–ENG–3 are receiver mounted. Model



1 Fuel tank
2 V-belt guard
3 Mounting base
4 Draincock
5 Globe valve
6 Safety valve
7 Pressure gage
8 Muffler

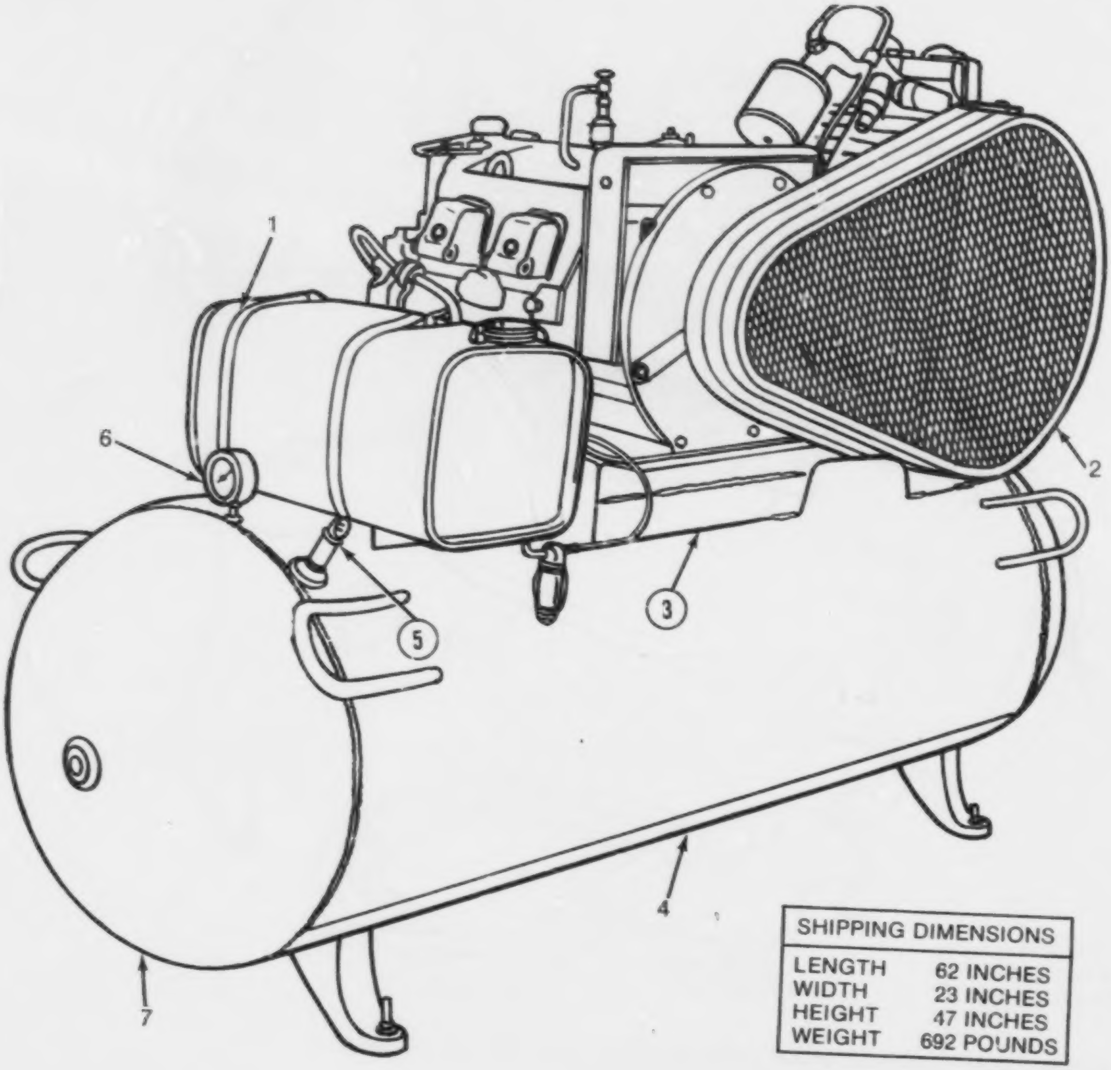
Figure 1-4. Air compressor (model OEG-458-ENG-1 and OEG-458-ENG-2) right rear, three-quarter view.

BMW–452–ENG, base mounted for mounting on a trailer, has a 12–volt starting system, including generator, regulator, and starter, and is completely enclosed by a metal enclosure assembly. Model BMW–452–ENG–1, base mounted, has a 24-volt starting system, including generator, regulator, and starter, and is completely enclosed by a metal enclosure assembly. Model OEG–458–ENG–3 is powered by a Military Standard Engine Model 4A032–1 (TM 5–2805–203–14). The remaining four models are powered by a Wisconsin Model MAENLD engine.

1–6. Tabulated Data

a. General.

Manufacturer ____________ Champion Pneumatic Machinery Co.



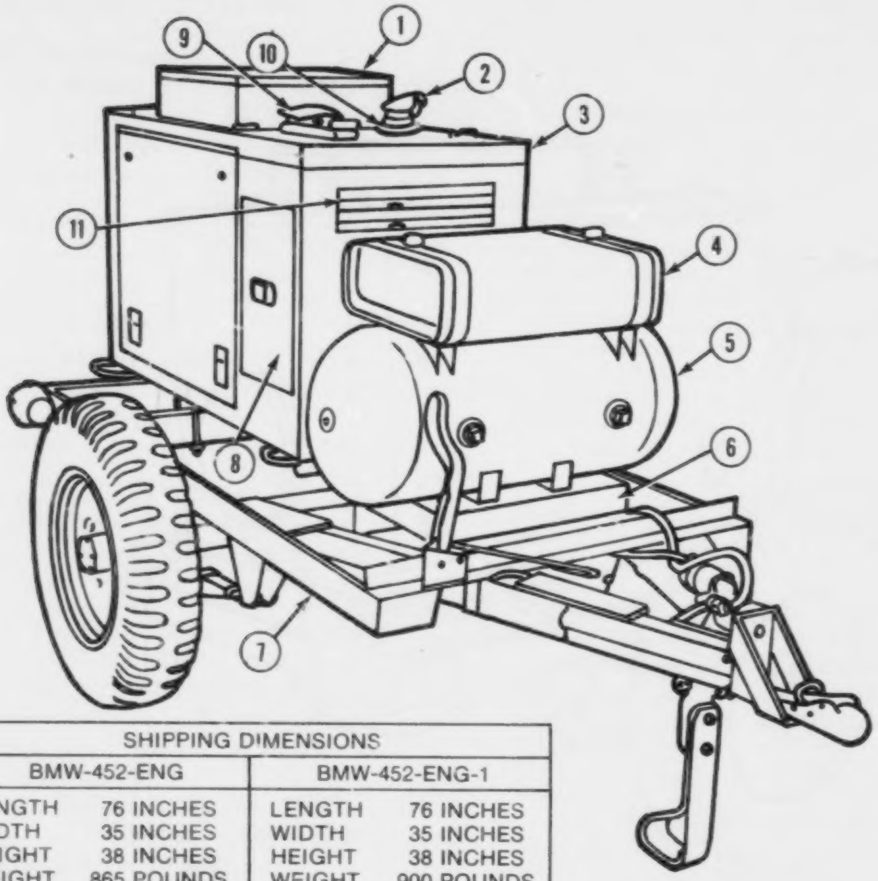
SHIPPING DIMENSIONS	
LENGTH	62 INCHES
WIDTH	23 INCHES
HEIGHT	47 INCHES
WEIGHT	692 POUNDS

1 Fuel tank
2 V-belt guard
3 Air receiver platform
4 Air receiver tank
5 Safety valve
6 Pressure gage
7 Draincock

Figure 1-5. Air compressor (model OEG-458-ENG-3) right rear, three-quarter view.

Model, receiver mounted ---OEG-458-ENG-1
Model, receiver mounted ---OEG-458-ENG-2
Model, receiver mounted ---OEG-458-ENG-3

Model, for trailer mounting --------------------BMW-452-ENG
Model, base mounted ------BMW-452-ENG-1
Output -----------------15 cfm



SHIPPING DIMENSIONS			
BMW-452-ENG		BMW-452-ENG-1	
LENGTH	76 INCHES	LENGTH	76 INCHES
WIDTH	35 INCHES	WIDTH	35 INCHES
HEIGHT	38 INCHES	HEIGHT	38 INCHES
WEIGHT	865 POUNDS	WEIGHT	900 POUNDS

1 Tool box
2 Muffler rain cap
3 Shroud
4 Fuel tank
5 Air receiver tank
6 Platform
7 Trailer
8 Instrument panel door
9 Fire extinguisher
10 Shield
11 Louver

Figure 1-6. Air compressor (model BMW-452-ENG), right front, three-quarter view.

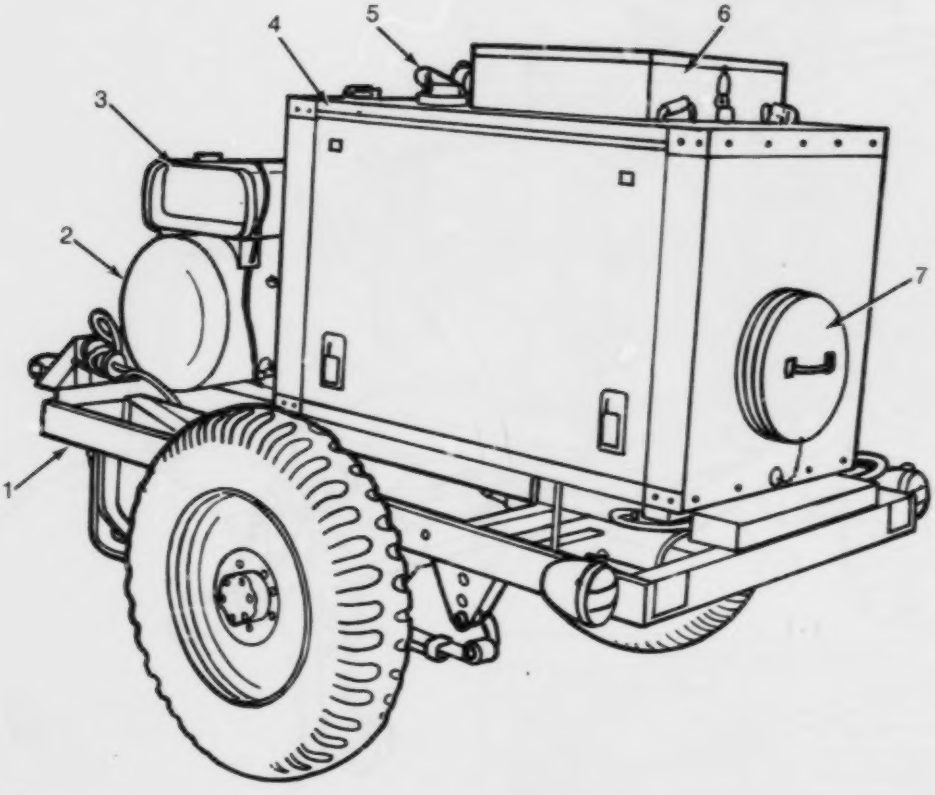
b. Gasoline Engines.

(1) *Model OEG-458-ENG-3.*

Make	Military Standard Engine
Model	4A032-1
Type	4-cycle, gasoline, overhead valve, air cooled
Number of cylinders	4
Firing order (by cylinder)	1-4-2-3
Bore	2.250 in. (inches)
Stroke	2.0 in.
Piston displacement	32 cu in. (cubic inches)
Compression ratio	6.0 to 1
Horsepower at 3,600 rpm	6 continuous at 3,600 rpm rated

(2) *Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1.*

Manufacturer	Wisconsin Motor Corporation
Model	MAENLD
Type	L-head
Number of cylinders	1
Cycle	4
Bore	3 in.
Stroke	3 1/4 in. (inch)
Cooling	Forced air



1 Trailer
2 Air receiver tank
3 Fuel tank
4 Shroud
5 Muffler rain cap
6 Tool box
7 Dust cover

Figure 1-7. Air compressor (model BMW-452-ENG), left rear, three-quarter view.

Horsepower	9.2 at 3600 rpm
Governed rpm	2,625 (with load)
Compression	85 to 95 psi
Rotation	Clockwise

c. Compressor Assembly.

Manufacturer	Champion Pneumatic Machinery Co.
Model	REN-14
Type	2-stage vertical
Speed	690 rpm
Bore and stroke:	
Low pressure stage	4 5/8 × 3 in.
High pressure stage	2 1/2 × 3 in.
Displacement	0.0292 cu ft per stroke at 700 rpm.

d. Gasoline Engine Components.

(1) *Carburetor.*

(*a*) *Models BMW-452-ENG, BMW-452-ENG-1, and OEG-458-ENG-1.*

Manufacturer	Bendix Aviation Corp.
Model	68
Type	Updraft

(*b*) *Model OEG-458-ENG-2.*

Manufacturer	Bendix Aviation Corp.
Model	L-63-E
Type	Updraft

(c) *Model OEG-458-ENG-3.*

Make	Military Design
Model	ERF 5710
Type	Float

(2) *Air Cleaner.*

(a) *Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1.*

Manufacturer	United Specialities Corp.
Type	Oil bath

(b) *Model OEG-458-ENG-3.*

Make	Military Design
Model	ERF 5820
Type	Dry element

(3) *Fuel filters.*

(a) *Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1.*

Manufacturer	Crippen Machine and Tool Co.
Type	LP 43

(b) *Model OEG-458-ENG-3.*

Make	Military Design
Model	ERV 3140
Type	Element

(4) *Magneto. Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1.*

Manufacturer	Fairbanks-Morse Co.
Type	FM-XDE (radio shielded)

(5) *Spark plug.*

(a) *Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1.*

Manufacturer	Champion Manufacturing Co.
Type	64K
Size	18-mm (millemeter)

(b) *Model OEG-458-ENG-3.*

Make	Military Standard
Model	MS 51009-1
Type	Shielded 14-mm

e. Generator — Model BMW-452-ENG.

Manufacturer	Electric Auto-Lite Co.
Type	12-volt

f. Regulator — Model BMW-452-ENG.

Manufacturer	Electric Auto-Lite Co.
Type	12-volt

g. Starter — BMW-452-ENG.

Manufacturer	Electric Auto-Lite Co.
Type	12-volt

h. Generator — Model BMW-452-ENG-1.

Manufacturer	Electric Auto-Lite Co.
Type	24-volt

i. Regulator — Model BMW-452-ENG-1.

Manufacturer	Electric Auto-Lite Co.
Type	24-volt

j. Starter — Model BMW-452-ENG-1.

Manufacturer	Electric Auto-Lite Co.
Type	24-volt

k. Compressor Air Cleaner.

Manufacturer	Champion Pneumatic Machinery Co.
Type	Dry

l. Capacities.

Air cleaner, engine	1/5 qt (quart)
Crankcase, engine	1 qt
Fuel tank (Model OEG-458-ENG-1)	2 3/4 gal. (gallon)
Fuel tank (Models BMW-452-ENG and BMW-452-ENG-1)	10 gal.
Crankcase, compressor	2 1/2 qt

m. Dimensions and Weights.

(1) *Model OEG-458-ENG-1.*

Shipping cube	53.3 cu ft. (cubic feet)
Length	63 in.
Height	50 in.
Width	24 in.
Weight (dry)	540 lb (pounds)
Shipping weight	604 lb

(2) *Model OEG-458-ENG-2.*

Shipping cube	52.5 cu ft
Length	63 in.
Height	49 in.
Width	24 in.
Weight	555 lb.

(3) *Model OEG-458-ENG-3.*

Shipping cube	59.4 cu ft
Length	62 in.
Height	47 in.
Width	23 in.
Weight	692 lb.

(4) *Model BMW-452-ENG.*

Shipping cube	80.6 cu ft
Length	76 in.
Height	38 in.
Width	35 in.
Weight (dry)	720 lb
Shipping weight	865 lb

(5) *Model BMW-452-ENG-1.*

Shipping cube	80.6 cu ft
Length	76 in.
Height	38 in.
Width	35 in.
Weight (dry)	765 lb
Shipping weight	900 lb

n. Air Receiver (Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3).

Manufacturer	Stover Co.

Working pressure ---------200 psi
Shell thickness -----------0.155 in.
Head thickness -----------0.134 in.
Maximum temperature ----450° F.

o. Air Receiver (Models BMW-452-ENG and BMW-452-ENG-1).

Manufacturer ------------Roy E. Roth Co.
Working pressure ---------200 psi
Shell thickness -----------0.1139 in.
Head thickness -----------0.1046 in.
Maximum temperature ----605°F.

p. Wiring Diagram. A practical wiring diagram for Model BMW-452-ENG is shown in figure 1-8.

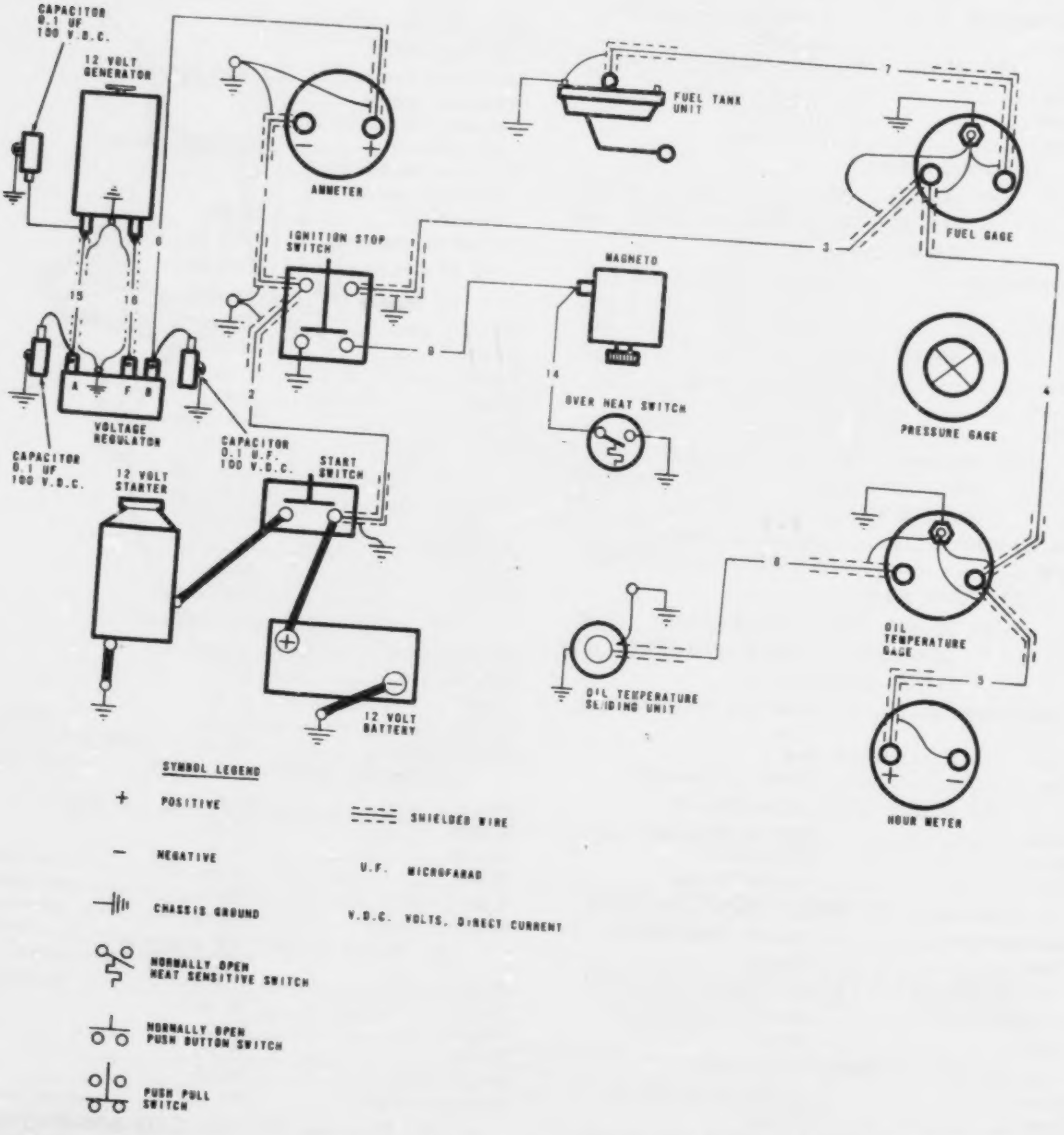


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Figure 1-8. Wiring diagram.

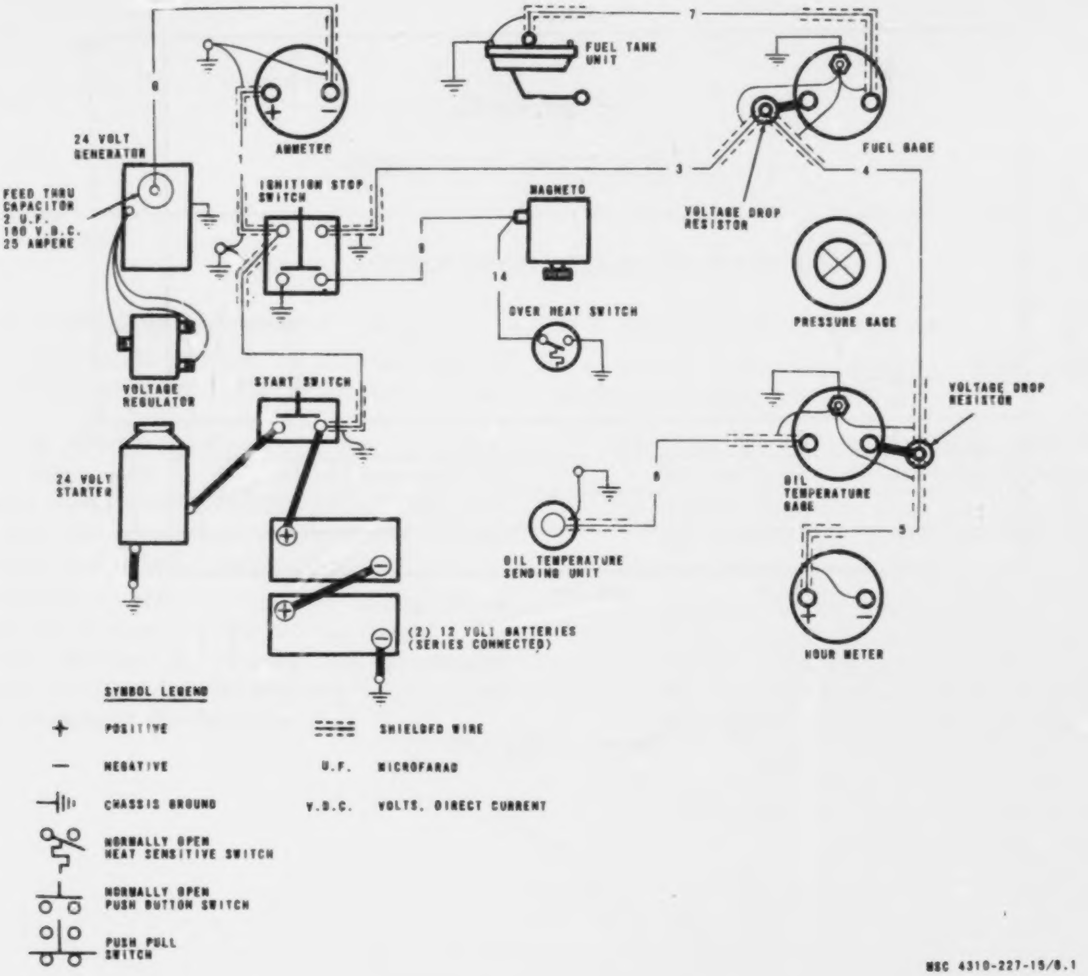

Figure 1-8—Continued.

q. Base Plan. Model OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3 air compressors can be installed on any suitable base such as concrete, wood, or steel. The necessary dimensions for installing bolts and locating the air compressor are shown in figure 1-9.

r. Nut and Bolt Torque Data.

(1) *Engine.*

Cylinder head bolts	32 ft-lb (foot pounds)
Drive pulley end plate screws	22-26 ft-lb
Engine base screws	7-9 ft-lb
Flywheel end plate bolts	22-26 ft-lb
Intake manifold bolts	9 ft-lb
Spark plug	24-26 ft-lb

(2) *Compressor assembly.*

Access cover plate screws	25 ft-lb
Connecting rod cap bolt	25 ft-lb
Cylinder to crankcase studs and nuts	45 ft-lb
Unloader body screws	29 ft-lb

s. Adjustment Data.

Magneto contact set	0.015 in.
Spark plug	0.030 in.
Valve clearance (cold):	
Intake	0.008 in.
Exhaust	0.016 in.

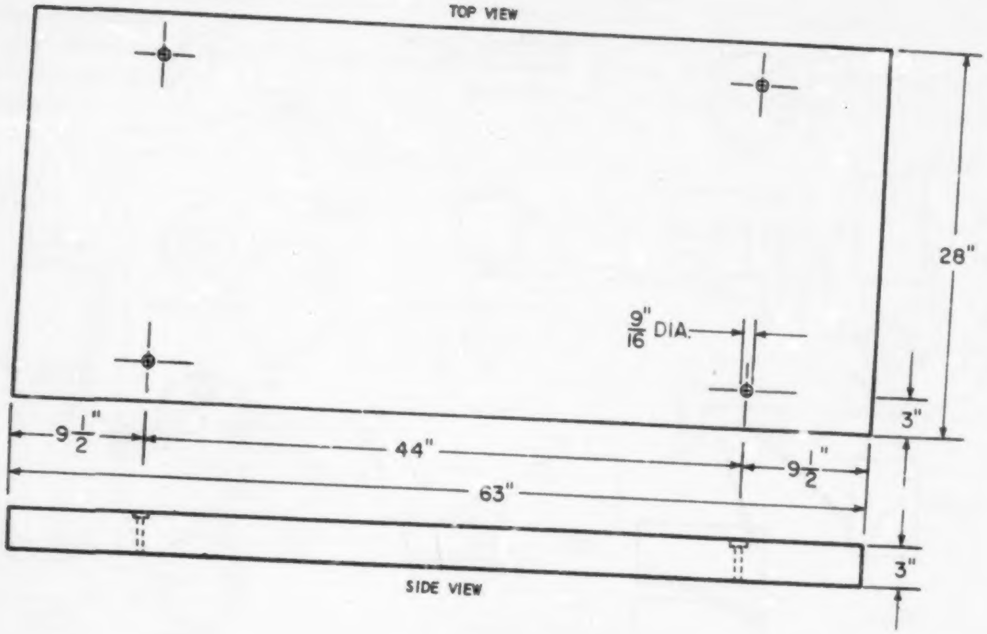

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Figure 1-9. Base plan.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2–1. Unloading Equipment

a. Remove all tiedowns or blocking that secure the compressor to the carrier. Refer to figure 2–1.

b. A forklift truck, pipe rollers, or a suitable hoist must be used when removing the crated compressors from the carrier. The trailer mounted compressor can be towed off the carrier if a suitable ramp is provided.

***Warning:* Make certain any lifting device used has a capacity equal to the weight being lifted. Failure to observe this precaution could result in injury or death to personnel and damage to the equipment.**

2–2. Unpacking New Equipment

a. Model OEG–458–ENG–1, OEG–458–ENG–2, and OEG–458–ENG–3.

(1) Place the air compressor as close to the point of installation as possible.

(2) Remove the crate from the base, being careful not to damage the air compressor.

(3) Remove the belt guard that is wired to the top of the crate and the box banded to the side of the crate. The box contains the hose assembly, tire gage, globe valve, and starter rope.

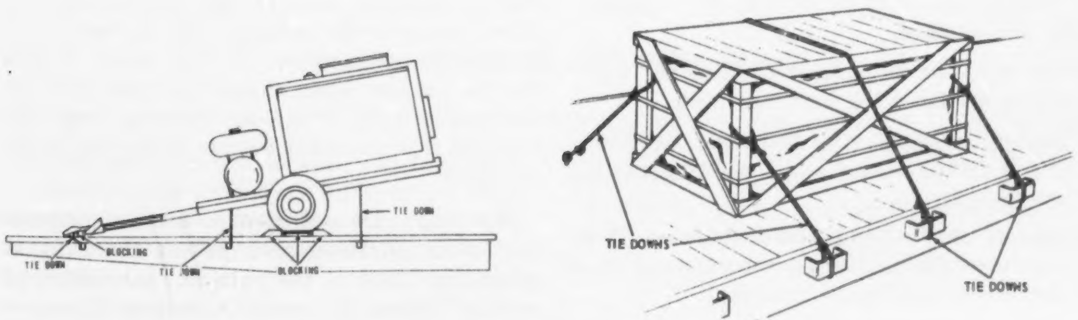

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Figure 2–1. Shipping tiedowns.

(4) Remove the four nuts and lockwashers that secure the air compressor to the bottom of the crate and remove the air compressor.

b. Models BMW-452-ENG and BMW-452-ENG-1.

(1) Place the air compressor as close to the point where it is to be used as possible.

(2) Remove the belt guard and box containing the hose assembly, tire gage, globe valve, and starter rope.

2-3. Removal of Protective Material and Devices

Prepare the compressor for inspection and/or operation as outlined on the DA Form 2258, which will be found fastened to the compressor in a conspicuous location.

2-4. Installation of Separately Packed Components

Install the tire gage, hose assembly, and globe valve (para 3-87).

2-5. Inspection of New Equipment

a. Make a thorough visual inspection of the air compressor. Inspect for loss or damage that may have occured in shipment.

b. Inspect the compressor assembly for oil leaks.

c. Inspect all safety valves for cracks, breaks, and damage.

d. Examine the shipping papers to see that the equipment listed has been received.

e. Inspect the spark plug and cable. See that the plug is firmly seated and that the cable is fastened securely.

f. Inspect the fuel lines and carburetor. See that the carburetor is securely mounted and the fuel line is not cracked or broken.

g. Correct any deficiencies noted or report them to field maintenance.

2-6. Servicing New Equipment

a. Perform the applicable daily services (para 3-8).

b. Lubricate the air compressor in accordance with the current lubrication order.

c. Remove the fuel tank cap and fill the fuel tank with the proper grade of gasoline. Install the fuel tank cap.

***Warning*: Do not fill the fuel tank while the engine is running. Be sure there are no open flames that may ignite the fuel vapors while the tank is being filled. Always provide a metal-to-metal contact between the container and tank to prevent a spark from being generated as gasoline flows over the metallic surfaces.**

2-7. Installation or Setting-Up Instructions

a. General. The air compressor should be installed on a level site, clear of obstacles, and with ample ventilation.

b. Installation. When preparing for a permanent installation, construct the base as outlined by figure 1-9. Select a site where there will be sufficient space on all sides for servicing and operation of the unit. For temporary installation, move the air compressor as close to the worksite as practical. Avoid, if possible, dusty or sandy locations. Use boards or other material for a base in areas where the ground is soft.

c. Indoor Installation. Keep the area well ventilated at all times so that the air compressor will receive a maximum supply of air. Install a gastight exhaust line to pipe the exhaust gases to the outside. Use as few bends in the line as possible. Provide metal shields for the exhaust lines where they pass through flammable walls. Wrap the exhaust lines with asbestos if there is any danger of anyone touching them.

***Warning:* Do not operate the air compressor in an enclosed area unless the exhaust gases are piped to the outside. Inhalation of exhaust fumes will result in serious illness or death.**

2-8. Inspection of Used Equipment

a. Inspect the air compressor, following the instructions in paragraph 2-5.

b. Pay particular attention to receiver tank mounting platform, air cleaner, and pressure gage.

c. Carefully inspect the fuel tank, fuel filter assembly, gasoline engine, and unloader valve. Inspect for fuel, oil, or air leaks.

d. Correct or report all deficiencies to organizational maintenance.

2-9. Servicing Used Equipment

Perform the procedures described in paragraph 2-6. Clean the exterior of the unit thoroughly. Coat the exposed metal surfaces with a film of oil or grease. Correct all deficiencies or report them to organizational maintenance.

Section II. MOVEMENT TO A NEW WORKSITE

2-10. Dismantling For Movement

a. Model OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3.

(1) Stop the air compressor (para 2-27).

(2) Remove the hose assembly (para 3-88).

(3) Remove the mounting hardware that secures the air compressor to the mounting base.

(4) Lift the air compressor onto the carrier with a lifting device of at least 800-pound capacity and move the air compressor to the new worksite.

b. Model BMW-452-ENG.

(1) Stop the air compressor (para 2-27).

(2) Remove the hose assembly (para 3-88), and place it in the stored position.

(3) Close and latch all doors.

(4) Attach the air compressor to the towing vehicle and tow the unit to the new worksite.

c. Model BMW-452-ENG-1.

(1) Stop the air compressor (para 2-27).

(2) Remove the hose assembly (para 3-88), and place it in the stored position.

(3) Close and latch all doors.

(4) Remove the mounting hardware that secures the air compressor to the mounting base.

(5) Lift the air compressor onto the carrier with a lifting device of at least 1,000 pound capacity and move the air compressor to the new worksite.

2-11. Reinstallation After Movement

a. Install the hose assembly (para 3-88).

b. Install the air compressor at the new worksite (para 2-7).

Section III. CONTROLS AND INSTRUMENTS

2-12. General

This section describes, locates, and furnishes the operator with sufficient information pertaining to the various controls and instruments provided for the proper operation of the air compressor.

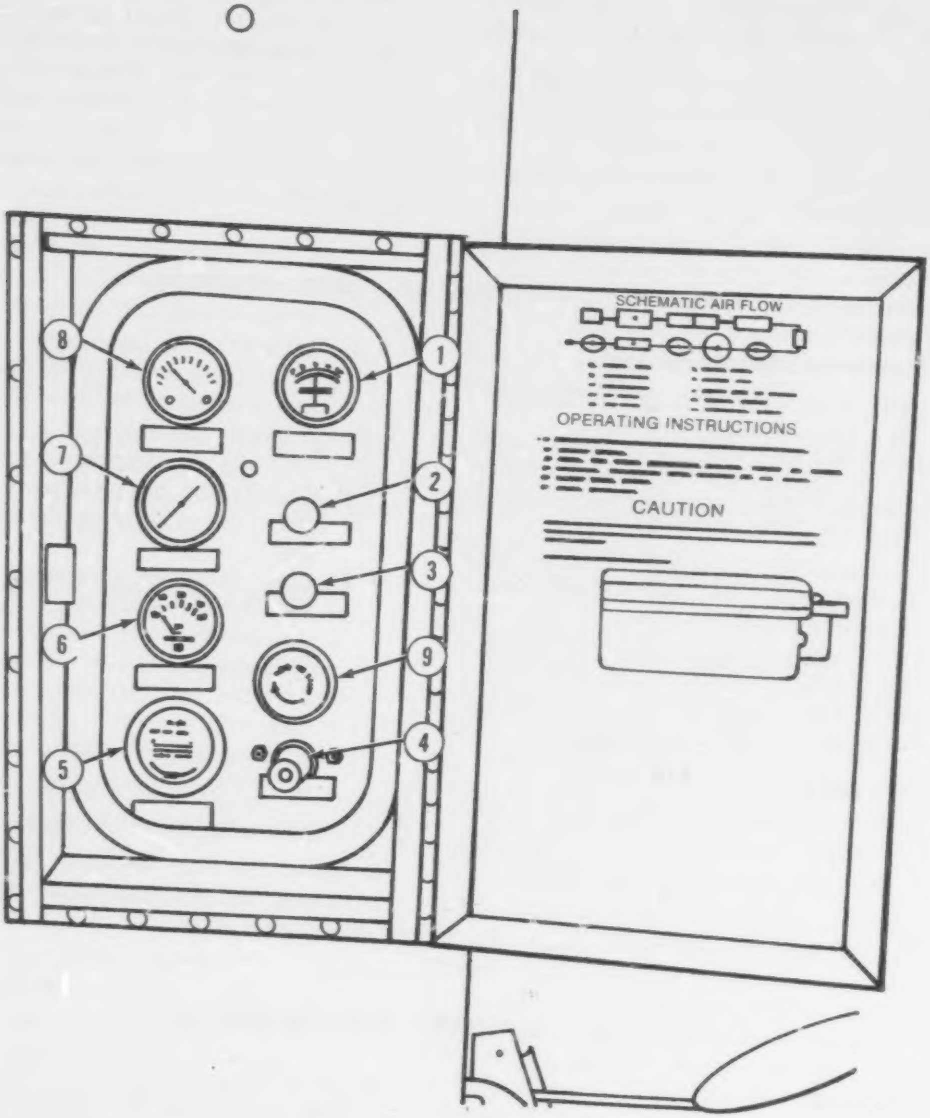
2-13. Air Pressure Gage

a. The air pressure gage (6, fig. 1-1), model OEG-458-ENG-1 and OEG-458-ENG-2, and (6, fig. 1-3) model OEG-458-ENG-3 mounted on the air receiver tank, indicates the amount of air pressure in the tank. The gage will read to 300 psi but normally will range between 0 to 175 psi.

b. The air pressure gage for models BMW-452-ENG and BMW-452-ENG-1 is located on the instrument panel (7, fig. 2-2).

2-14. Fuel Gage

The fuel gage (8, fig. 2-2), models BMW-452-ENG and BMW-452-ENG-1, mounted on the instrument panel, indicates the amount of fuel in the fuel tank.



1 Ammeter
2 Stop button
3 Choke
4 Start button
5 Hourmeter
6 Temperature gage
7 Pressure gage
8 Fuel gage
9 Governor control

Figure 2-2. Instrument panel, models BMW-452-ENG and BMW-452-ENG-1.

2-15. Ammeter

The ammeter (1, fig. 2-2), models BMW-452-ENG and BMW-452-ENG-1, mounted on the instrument panel, indicates the rate of charge or discharge of the battery. The gage will read from 0 to 30 on both charge and discharge side but normally will range between 0 and 30 on the charge side.

2-16. Hourmeter

The hourmeter (5, fig. 2-2), models BMW-452-ENG and BMW-452-ENG-1, mounted on the instrument panel, records engine operating time in hours.

2-17. Engine Oil Temperature Gage

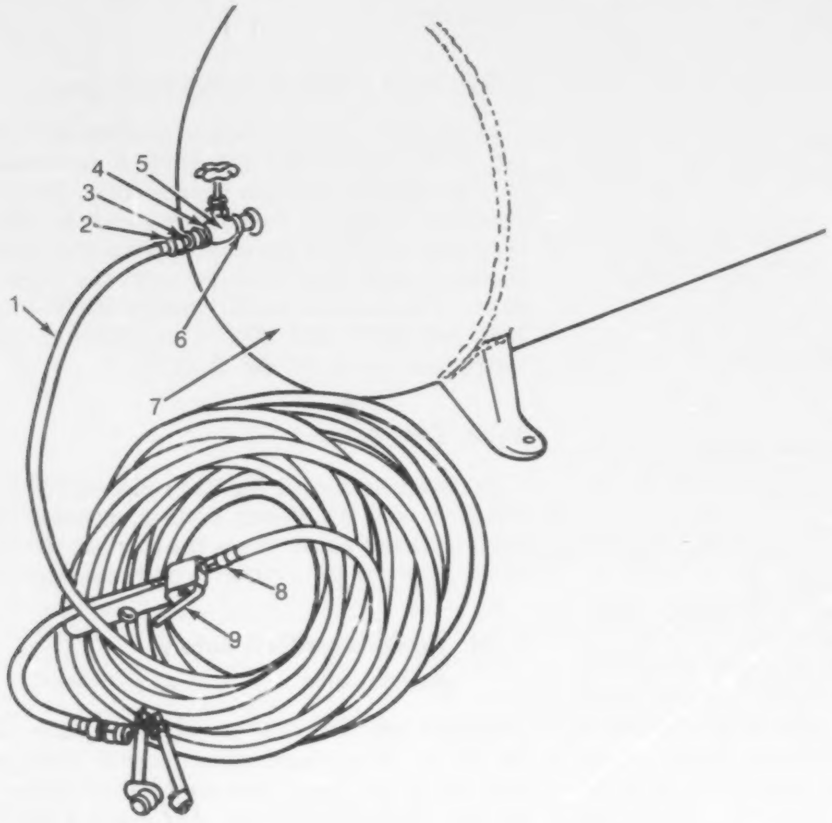
The engine oil temperature gage (6, fig. 2-2), models BMW-452-ENG and BMW-452-ENG-1, mounted on the instrument panel, indicates the temperature of the engine lubricating oil.

2-18. Globe Valve

The globe valve (5, fig. 2-3), located on the end of the air receiver tank (7), controls the flow of compressed air to any attached pneumatic equipment. It is a disk-valve type of control.

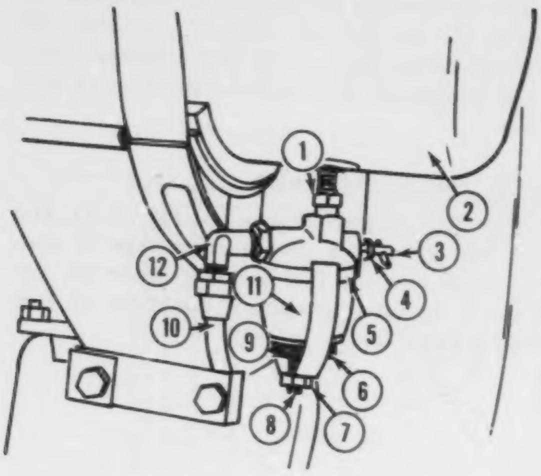
2-19. Fuel Shutoff Valve

The fuel shutoff valve (3, fig. 2-4) and (18, fig. 2-6) is a needle-valve type of control located in the fuel strainer cover (5, fig. 2-4). It is used to control the flow of fuel from the fuel tank.



1 Air hose	4 Pipe bushing	7 Air receiver tank
2 Coupling nut	5 Globe valve	8 Coupling nut
3 Adapter	6 Nipple, pipe	9 Inflator gage

Figure 2-3. Discharge hose assembly, tire inflating gage, and globe valve, removal points.



1 Nipple, pipe, brass 1/8-27
2 Fuel tank
3 Fuel shutoff valve
4 Packing nut
5 Strainer cover
6 Bail
7 Bail screw nut (spec)
8 Bail screw (spec)
9 Knurled nut
10 Fuel strainer-to-carburetor tube
11 Sediment bowl
12 Elbow

Figure 2-4. Fuel strainer, Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3, removal points.

2–20. Choke Lever

The choke lever (31, fig. 2–7), models OEG–458–ENG–1 and OEG–458–ENG–2, is mounted on the carburetor (36). It is used to regulate the flow of air to the carburetor. It is a buterfly–valve type of control. The choke for models BMW–452–ENG and BMW–452–ENG–1 is located on the instrument panel (3, fig. 2–2). Refer to TM 5–2805–203–14 for engine data applicable to Model OEG–458–ENG–3.

2–21. Governor Control Assembly

a. The governor control assembly, models OEG–458–ENG–1 and OEG–458–ENG–2, are mounted on the drive pulley side of the cylinder and crankcase assembly. The governor adjusting lever (15, fig. 2–8) is a manually operated, tension-positioned lever used to adjust the speed of the engine. On models BMW–452–ENG and BMW–452–ENG–1 the governor is controlled by the knob (9, fig. 2–2). Refer to TM 5–2805–203–14 for engine data applicable to model OEG–458–ENG–3.

b. The variable speed governor is set for two speeds. Pushed in and locked allows the engine to run at idling speed. When the control is pulled full out, the engine is set to run at full governed speed. To set the control on models BMW–452–ENG and BMW–458–ENG–1, it is only necessary to turn the knob to the right.

2–22. Engine Ground Switch Pushbutton

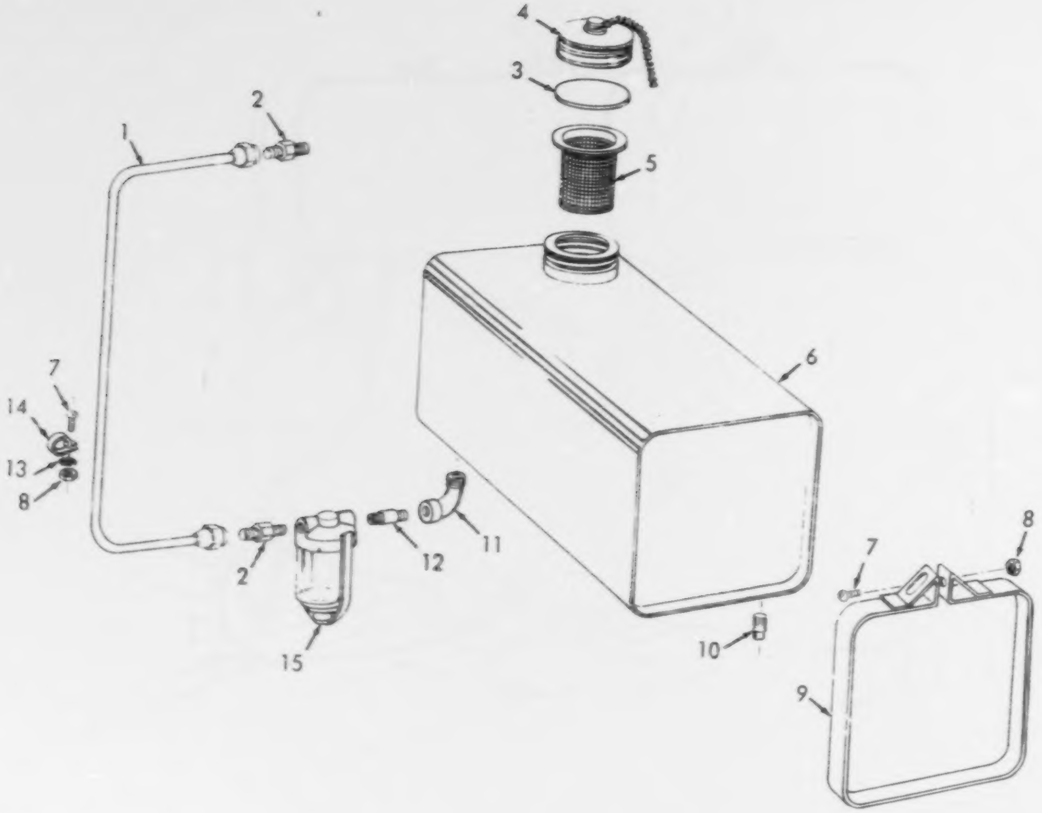
The engine ground switch pushbutton (17, fig. 2–7), model OEG–458–ENG–1, is located on the magneto ignition shield (13). It is a manually operated pushbotton used to stop the engine. To stop the engine, press the pushbutton in and hold it there until the engine stops. The stop button for models BMW–452–ENG and BMW–452–ENG–1 is located on the instrument panel (2, fig. 2–2).

2–23. Start Button

The start button (4, fig. 2–2) models BMW–452–ENG and BMW–452–ENG–1, mounted on the instrument panel, closes the starting circuit which activates the starter to start the engine.

2–24. Air Receiver Tank Safety Relief Valve

The air receiver tank safety relief valve (7, fig. 1–1), is spring-tension popoff type, is mounted at the end of the air receiver tank on models OEG–458–ENG–1, OEG–458–ENG–2, and OEG–458–ENG–3. On models BMW–452–ENG and BMW–452–ENG–1, it is located on the left rear side of the air receiver tank. It is a combination automatic and manually operated valve. It limits the amount of pressure in the tank to 185 psi. It also provides a means of releasing tank pressure in the event of an emergency or when all other outlets are in use.



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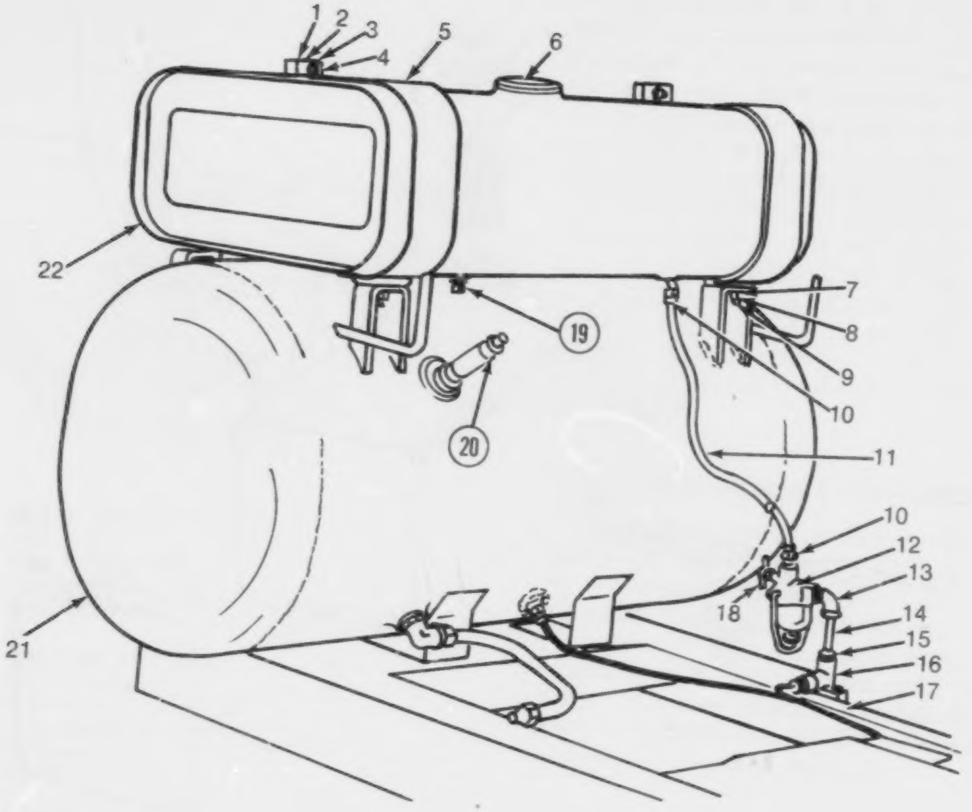
1 Tube
2 Adapter
3 Gasket
4 Cap
5 Screen

6 Tank
7 Screw (2)
8 Nut (2)
9 Strap (2)
10 Plug

11 Elbow
12 Nipple
13 Washer
14 Clamp
15 Strainer.

Figure 2-5. Fuel tank, strainer, and related parts, exploded view.



1 Washer, flat
2 Washer, lock
3 Nut
4 Screw, cap
5 Strap assembly
6 Cap with chain
7 Washer, lock
8 Nut
9 Screw, cap
10 Compression body
11 Hose assembly
12 Fuel strainer
13 Elbow
14 Nipple
15 Bushing
16 Elbow
17 Fuel strainer-to-fuel pump tube
18 Fuel shutoff valve
19 Drain plug
20 Safety valve
21 Air receiver tank
22 Fuel tank

Figure 2-6. Fuel strainer, fuel tank, models BMW-452-ENG and BMW-452-ENG-1, removal points.

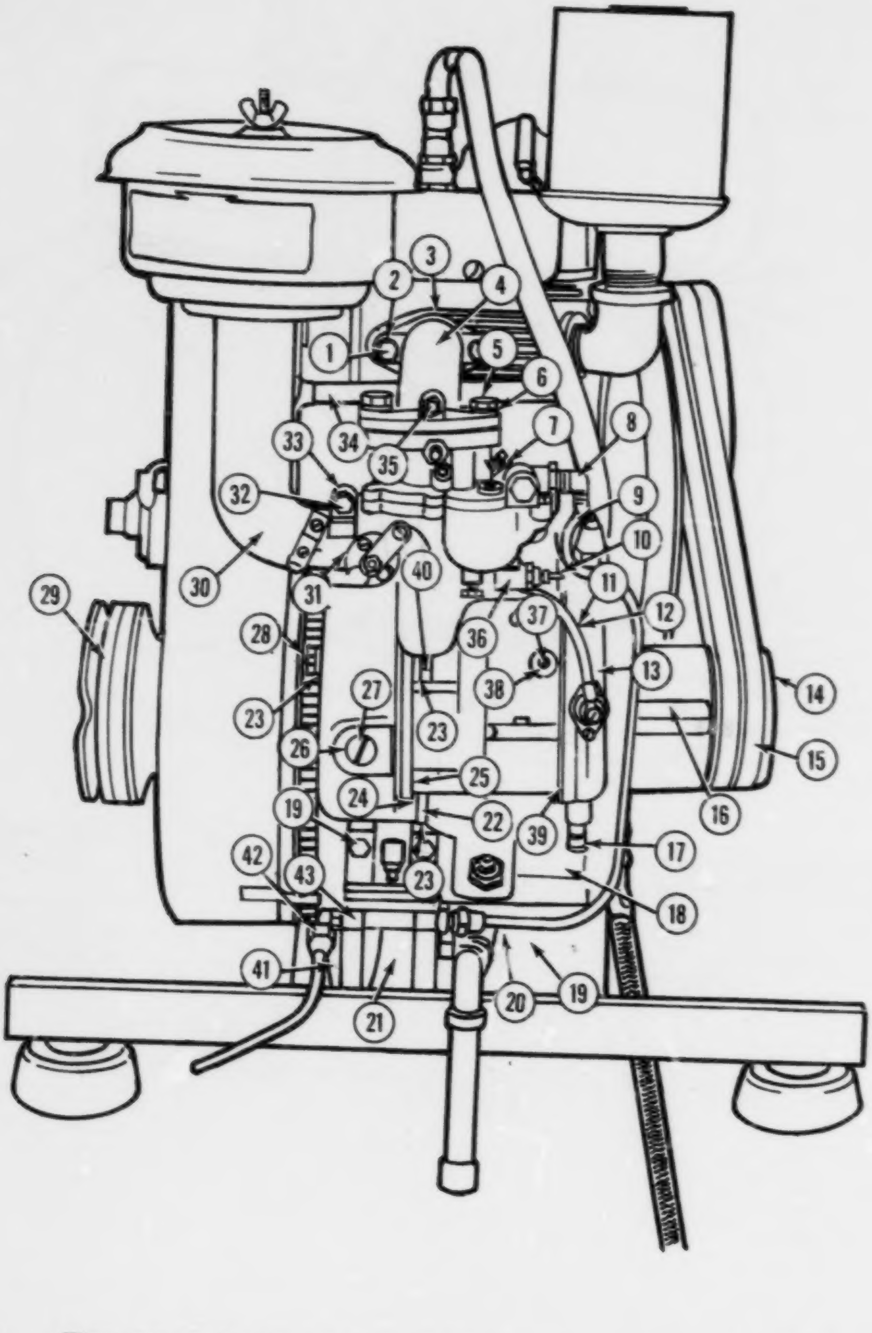
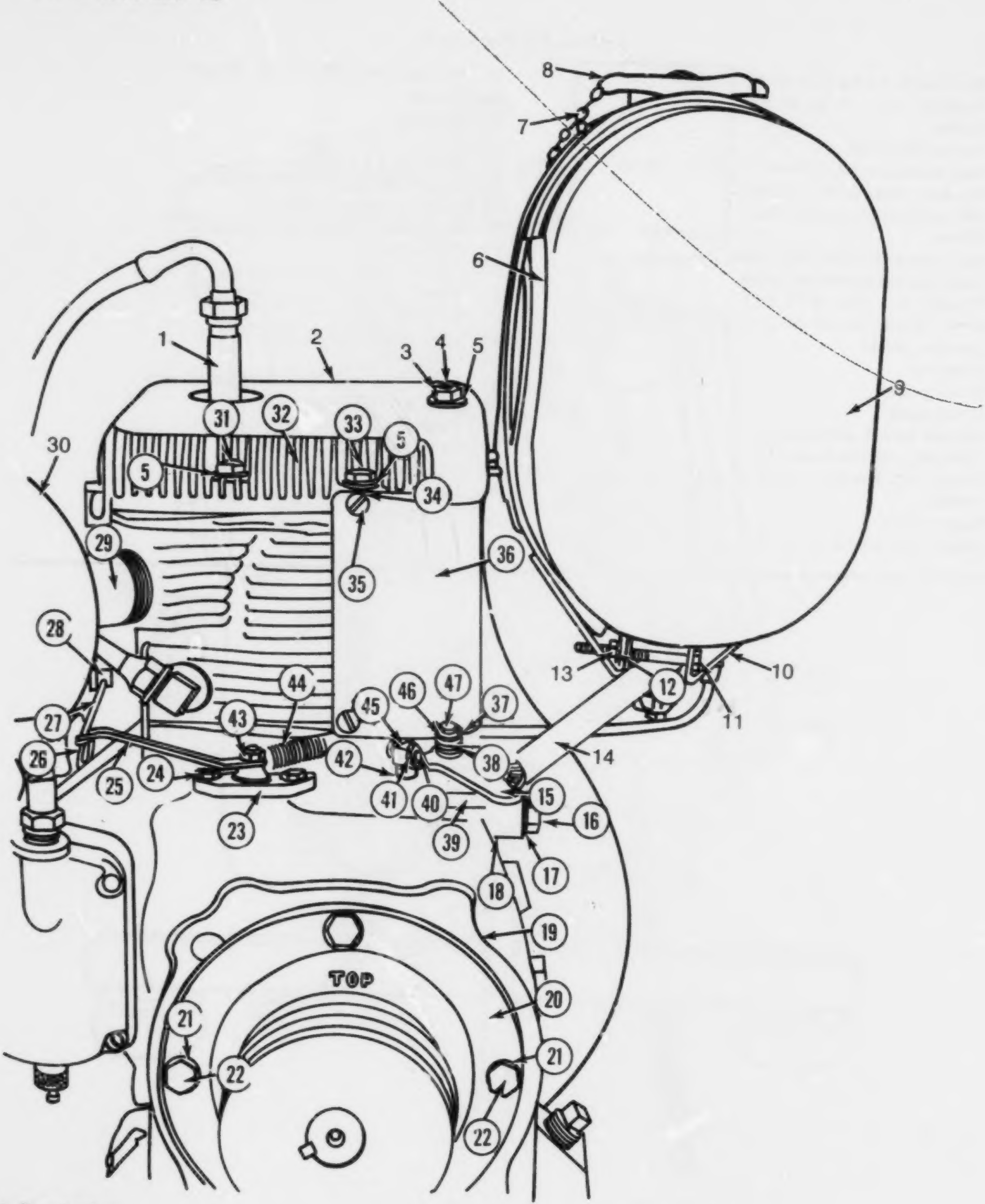


Figure 2-7. Carburetor, intake manifold, magneto, engine base,. and fuel pump, removal points.

Callouts For Figure 2-7.

1 Bolt, mach. hx-hd, 1/4-20 in. (2 rqr)
2 Washer, lock, 1/4 in. (2 rqr)
3 Gasket
4 Intake manifold
5 Bolt, mach, hx-hd, 5/16-18 × 7/8 in. (2 rqr)
6 Washer lock, 5/16 in (2 rqr)
7 Idle adjustment needle valve
8 Elbow
9 Fuel pump-to-carburetor tube
10 High speed adjustment valve
11 Washer, lock, No. 10 (4 rqr)
12 Screw, mach, No. 10-24 × 5/8 in. (4 rqr)
13 Ignition shield
14 Setscrew
15 Drive pulley
16 Crankshaft
17 Ground switch pushbutton
18 Cylinder and crankcase Ay.
19 Screw, cap, hex-hd, 1/4-20 × 3/4 in. (12 rqr)
20 Gasket
21 Engine base
22 Screw, cap, hx-hd, 5/16-18 × 1 in.
23 Washer, lock, IT, 5/16in. (3 rqr)
24 Gasket
25 Magneto
26 Magneto timing mark (x)
27 Magneto drive gear
28 Bolt, mach. 5/16-24 × 2 5/8 in.
29 Starting pulley assembly
30 Air cleaner bracket
31 Choke lever
32 Screw, mach. 1/4-20 × 1 in.
33 Clamp gasket
34 Breather line
35 Plug (spec)
36 Carburetor
37 Screw, mach. 6-32 × 5/16 in. (2 rqr)
38 Vent cover (2 rqr)
39 Gasket
40 Nut, plain, hex, 5/16-24
41 Fuel strainer-to-fuel pump tube
42 Fuel pump elbow
43 Fuel pump



1 Spark plug
2 Air shroud cover
3 Nut, plain, hex, 3/8-24
4 Stud, plain, 3/8-16 one end, 3/8-24 other end, 3 1/4 in.
5 Washer, lock 3/8 in. (6 rqr.)

Figure 2-8. Fuel tank, muffler, spark plug, cylinder head, and governor control assembly, model OEG-458-ENG-1 and OEG-458-ENG-2, removal points.

Callouts For Figure 2-8—Continued.

6 Leather liner (2 rqr)
7 Chain
8 Fuel tank cap
9 Fuel tank
10 Fuel tank strap (2 rqr)
11 Screw, mach, pan-hd, 1/4-20 1 3/4 in. (2 rqr)
12 Washer, lock, 1/4 in. (2 rqr)
13 Nut, plain, hex, 1/4-20 (2 rqr)
14 Fuel tank bracket
15 Adjusting lever
16 Screw, cap, hex-hd, 3/8-16 × 1 in. (2 rqr)
17 Washer, lock, 3/i in. (2 rqr)
18 Control bracket brace
19 Cylinder and crankcase Ay.
20 Drive pulley end plate
21 Washer, lock, 3/8 in. (4 rqr)
22 Screw, cap, hex-hd, 3/8-16 × 1 in. (4 rqr)
23 Support bracket
24 Screw, cap, hex-hd, 1/4-20 × 3/4 in. (2 rqr)
25 Governor control lever
26 Pin, cotter, 3/64 × 3/8 in.
27 Control rod
28 Throttle shaft swivel block
29 Nipple, pipe, 1-11 1/2 × 3 in.
30 Muffler
31 Screw, cap, hex-hd, 3/8-16 × 1 1/2 in. (3 rqr)
32 Cylinder head
33 Screw, cap, hex-hd, 3/8-16 × 1 1/4 in. (2 rqr)
34 Washer, lock, 1/4 in. (4 rqr)
35 Screw, mach. 1/4-20 × 3/8 in. (4 rqr)
36 Air shroud
37 Pin, cotter, 1/16 × 1 in.
38 Compression spring
39 Control bracket
40 Spring adjusting screw
41 Nut, plain, hex, 10-32 (2 rqr)
42 Washer, flat, 0.88 in. id, 0.375 in. od, 0.049 in. thk
43 Nut, plain, hex, 1/4-28
44 Extension spring
45 Swivel block
46 Washer, flat, 1/4 in.
47 Pin, straight, threaded, 1/4-20 × 1 5/16 in.

Section IV. OPERATION UNDER USUAL CONDITIONS

2-25. General

a. The instructions in this section are for the information and guidance of the personnel responsible for the operation of the air compressor.

b. It is essential that the operator know how to perform every operation of which the air compressor is capable. This section gives instructions on starting and stopping the air compressor, on the basic motions of the air compressor, and on co-ordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary the given procedure to fit the individual job.

2-26. Starting

a. Model OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3.

(1) Perform the applicable daily services (para 3-8).

Note. For cold weather starting, refer to paragraph 2-23.

(2) Open the fuel shutoff valve (3, fig. 2-4).

(3) Move the choke lever (31, fig. 2-7) to the CL (closed) position.

(4) Close the globe valve (5, fig. 2-3).

(5) Open the air receiver tank draincock (4, fig. 1-4).

(6) Wind the engine starter rope around starting pulley assembly (29, fig. 2-7), and with a quick, steady pull, start the engine.

(7) Allow the engine to run for several minutes; gradually open the choke lever until the engine is warmed up and running smoothly.

(8) Close the air receiver tank draincock.

(9) As the air compressor operates, the air pressure gage (6, fig. 1-1) will indicate the amount of pressure in the receiver tank. Check the gage frequently so that the compressor may be shut down when the desired pressure has been reached.

b. Models BMW-452-ENG and BMW-452-ENG-1.

(1) Perform the appropriate procedures in *a* above.

(2) Pull the choke lever (3, fig. 2-2).

(3) Press the starter button (4, fig. 2-2).

(4) Push the choke lever (3, fig. 2-2).

2-27. Stopping

a. Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3.

(1) Close the globe valve (5, fig. 2-3).

(2) Press and hold the ground switch pushbutton (17, fig. 2-7) until the engine stops.

(3) Open the air receiver tank draincock and allow the accumulated air and moisture to drain from the tank. Close the draincock.

(4) Close the fuel shutoff valve (3, fig. 2-4).

(5) Perform the applicable daily services (para 3-8).

b. Models BMW-452-ENG and BHW-452-ENG-1.

(1) Perform the appropriate procedures in *a* above.

(2) Push the stop button (2, fig. 2-2).

2-28. Operating Details

Except for starting and stopping the engine, this unit is fully automatic. The air compressor will continue to operate as long as the fuel supply lasts or until it is stopped manually. When air pressure reaches 175 psi, the unloader valve opens. The unloader valve remains open and releases air until the pressure in the air receiver tank falls below 175 psi.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

2-29. General

Operation of the air compressor under unusual conditions presents problems that demand special precautions and extreme care in servicing the air compressor. This section will list the conditions and furnish instructions for operating the unit at the highest performance level.

2-30. Operation in Extreme Cold

a. Fuel System. In cold weather, condensation will cause the formation of ice crystals which will accumulate in partially filled tanks, drums, and other fuel containers. These crystals will clog fuel lines and carburetor jets unless the following precautions are taken:

(1) Remove snow and ice from the fuel tank filler cap and dispensing equipment before filling the tank.

(2) Use filter paper, chamois, or any comparable strainer when filling the fuel tank or when transferring fuel from one container to another.

***Warning:* Provide a metal-to-metal contact between the fuel tank and fuel container to avoid the possibility of a static spark igniting the fuel.**

(3) Fill the fuel tank frequently to keep it full when operating the unit in cold weather. This helps to prevent moisture from forming in the tank.

b. Lubrication. Lubricate the unit in accordance with the cold weather instructions contained in the current lubrication order.

c. Airhose. At low temperatures, the airhose will become brittle. Avoid excessive handling and kinking.

d. Shelter. Locate the compressor indoors whenever possible. The immediate area should be heated in extreme cold since condensation will cause water to accumulate around the compressor valves, which will freeze, locking and damaging the valves. When operated outdoors, locate the unit behind a windbreak and cover the compressor with a tarpaulin when not in use.

e. Starting, Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3.

(1) Before attempting to start the engine in extreme cold, be sure that the consistency of the oils in the engine and compressor crankcases is thin enough to furnish proper lubrication.

(2) Close the choke lever (31, fig. 2-7) and turn the engine over until the

ignition system fires. Once the ignition has fired, open the choke one-quarter. Starting may be difficult. Be careful not to flood the engine by closing the choke too long before the engine starts. Hold the choke open to avoid stalling once the engine starts.

(3) Allow the engine to run until the engine and compressor crankcase oils have become hot enough to vaporize any water that may have condensed while the unit was inoperative.

f. Starting, Models BMW-452-ENG and BMW-452-ENG-1.

(1) These models are winterized to -65° F. after the addition of subzero engine oil. To start the unit at temperatures from -25° to -65°F. the unit must be preheated. The metal enclosure is provided with a heater duct connection for use with a heater.
(2) Remove the heater dust cover and attach heater hose.
(3) Close the doors.
(4) Open adjustable louvers fully.
(5) Start the heater and allow it to run for a period of 30 minutes at 150° to 200°F. discharge temperature.
(6) Shut heater off.
(7) Choke fully by pulling choke out and crank once.
(8) Open choke half way and repeat cranking.
(9) When engine starts, open choke by pushing choke knob full in.
(10) Operate engine at 1800 revolutions per minute (rpm) (throttle control full in) for minimum of 10 minutes. Unlatch door of enclosure and allow it to hang open, but not raised.
(11) Pull throttle control full out and operate for 5 minutes with air tank valve open and hose or attachments disconnected before closing air tank valve and pressurizing system.

2-31. Operation in Extreme Heat

a. Indoor Ventilation. Provide sufficient room around the air compressor to allow proper air circulation In addition to the consumption of large quantities of air this unit is air cooled. Insufficient air circulation will cause overheating and lower the performance level of the unit. Keep the doors and louver open fully.

b. Cooling System. Blow or brush dirt and dust from the engine and compressor cooling fins. Inspect the engine air shroud for foreign matter that may restrict the flow of air. Check the belt tension frequently. Loose belts can cause overheating.

c. Lubrication. Lubricate the unit in accordance with the current lubrication order.

2-32. Operation in Dusty or Sandy Areas

a. Protection. Take advantage of natural barriers that will afford some protection from blowing dust or sand. Use a tarpaulin to construct a screen or shelter for the unit. Cover the unit when inoperative.

b. Lubrication. Operating of the air compressor under dusty or sandy conditions will require more frequent lubrication. Carefully clean all lubrication points before inspecting or lubricating the unit. Lubricate in accordance with the current lubrication order. Be careful to keep the lubricants free from dust and grit. Avoid excessive lubrications, as dust and dirt will collect and adhere to lubricated areas. Daily servicing of the engine and compressor air cleaners is also required in dusty and sandy areas. Refer to paragraph 3-6 for servicing of the engine and compressor air cleaners.

c. Fuel System. Take adequate precautions to prevent sand or dust from entering the fuel tank. Service the fuel strainer sediment bowl as frequently as necessary to keep it free from dirt and grit. Store fuel supplies in tightly closed containers and locate in a protected area.

2-33. Operation Under Rainy or Humid Conditions

If the unit is outdoors and inoperative, place a canvas or other waterproof cover over the unit during storms. Remove the cover during dry periods. Uncover the unit and allow it to dry after storms. During humid periods, dry the unit before operation. Keep the fuel tank full to avoid condensation. Frequently drain accumulated condensation from the air receiver tank. Refer to paragraph 2-34 for protection of exposed surfaces.

2-34. Operation in Salt Water Areas

a. Cleaning. Wash the unit with fresh, clean water when the unit becomes encrusted with salt. When salt water comes in contact with bare metal surfaces, a highly corrosive action takes place.

b. Lubrication. Clean all lubrication points before applying lubricants to the unit. Lubricate in accordance with the current lubrication order.

c. Protection. Refer to TM 9-213 and coat all exposed metal surfaces with a standard issue rustproofing material. Keep the unit covered when inoperative.

2-35. Operation in High Altitudes

a. The compressor is designed to operate at elevations up to 5,000 feet above sea level without special service or adjustment.

b. Above 5,000 feet, compressor efficiency may be reduced as much as 20 percent. This is a normal condition which cannot be prevented, but maximum performance can be maintained by taking the following precautions:

(1) *Fuel.* Fill the tank at the end of each day to prevent condensation in the fuel tank.

(2) *Carburetor.* Since the amount of oxygen available to the carburetor at high altitudes will be reduced, adjust the carburetor idle adjustment needlevalve to the proper fuel-air mixture.

Section VI. OPERATION OF MATERIEL USED IN CONJUNCTION WITH THE AIR COMPRESSOR

2-36. Fire Extinguisher (Dry Chemical Type)

a. Description. The dry chemical type fire extinguisher is suitable for use on all types of fire and is effective in areas when ambient temperature is -25°F. and above. If winterized, (pressurized with nitrogen) the fire extinguisher may be used in temperatures below -25°F. The fire extinguisher is a 2 1/2 pound, stored pressure, lever-operated extinguisher.

b. Operation. Remove the fire extinguisher from its location, lift the handle, press lever, and direct the powder at the base of the flame using a side-to-side sweeping motion.

c. Maintenance. Weigh the fire extinguisher every 6 months and replace the extinguisher if weight is less than 4 1/2 pounds, or if pressure is below 125 pounds. Refer to TB 5-4200-200-10. The dry chemical fire extinguisher will be serviced at installation level through Repair and Utilities facilities, with the filling agent supplied by local procurement through Troop Supply Channels.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3-1. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for the maintenance of the air compressor.

3-2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for the air compressor are listed in the basic issue items list, appendix B of this manual.

3-3. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed and illustrated in TM 5-4310-227-25P.

3-4. Maintenance Function Information

Maintenance functions in this chapter cover all five models. Like components on Models OEG-458-ENG-1, OEG-458-ENG-2, OEG-458-ENG-3, BMW-452-ENG, and BMW-452-ENG-1 are replaced or repaired in the same or in a similar manner, unless otherwise annotated.

Section II. LUBRICATION

3-5. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 3-1 in an exact reproduction of the approved lubrication order for the air compressors. For current lubrication order, refer to DA Pam 310-4.

3-6. Detailed Lubrications Instructions

a. Care of Lubricants. Keep all lubricants in sealed containers and store in a clean, dry area away from heat. Do not allow foreign materials to come in contact with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Points of Application. Follow the detailed lubrication instructions given beneath each lubrication point illustration. Apply only those lubricants specified on the current lubrication order.

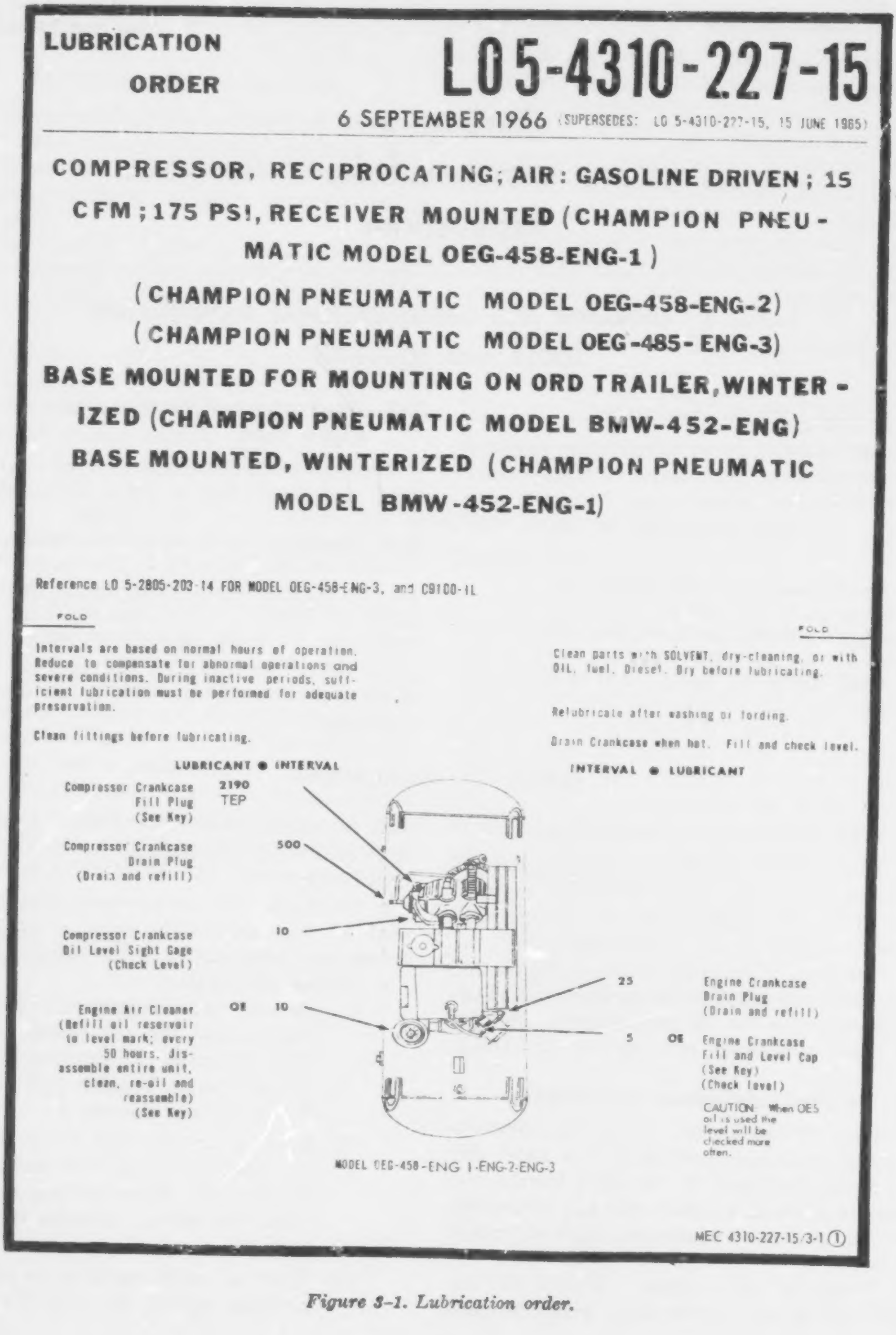
c. Cleaning. Use an approved cleaning solvent to clean around the point of application before and after applying the lubricant.

d. Engine Air Cleaner.

(1) Remove the wingnut (1, fig. 3-2) that secures the air cleaner cap and filter assembly (2) and oilcup (19) to the air cleaner bracket (17). Remove the entire air cleaner.

(2) Remove the cap and filter assembly (2) from the oilcup (19) and pour out the dirty oil. Remove the gasket from inside the oilcup. Remove the gasket from the bracket.

(3) Wash all metal parts in an approved cleaning solvent and dry thoroughly.



LUBRICATION ORDER

LO 5-4310-227-15

6 SEPTEMBER 1966 (SUPERSEDES: LO 5-4310-227-15, 15 JUNE 1965)

COMPRESSOR, RECIPROCATING; AIR: GASOLINE DRIVEN; 15 CFM; 175 PSI, RECEIVER MOUNTED (CHAMPION PNEUMATIC MODEL OEG-458-ENG-1) (CHAMPION PNEUMATIC MODEL OEG-458-ENG-2) (CHAMPION PNEUMATIC MODEL OEG-485-ENG-3) BASE MOUNTED FOR MOUNTING ON ORD TRAILER, WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG) BASE MOUNTED, WINTERIZED (CHAMPION PNEUMATIC MODEL BMW-452-ENG-1)

Reference LO 5-2805-203-14 FOR MODEL OEG-458-ENG-3, and C9100-IL

FOLD

FOLD

Intervals are based on normal hours of operation. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Relubricate after washing or fording.

Drain Crankcase when hot. Fill and check level.

	LUBRICANT ●	INTERVAL
Compressor Crankcase Fill Plug (See Key)	2190 TEP	
Compressor Crankcase Drain Plug (Drain and refill)		500
Compressor Crankcase Oil Level Sight Gage (Check Level)		10
Engine Air Cleaner (Refill oil reservoir to level mark; every 50 hours, disassemble entire unit, clean, re-oil and reassemble) (See Key)	OE	10

INTERVAL	● LUBRICANT	
25		Engine Crankcase Drain Plug (Drain and refill)
5	OE	Engine Crankcase Fill and Level Cap (See Key) (Check level)

CAUTION: When OES oil is used the level will be checked more often.

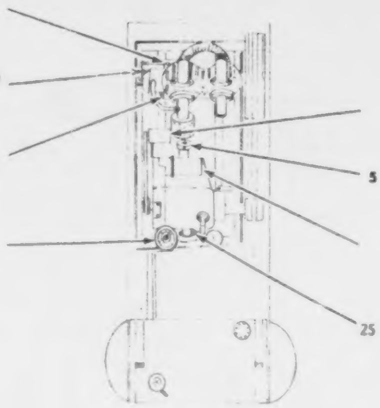
MODEL OEG-458-ENG 1-ENG-2-ENG-3

MEC 4310-227-15/3-1 ①

Figure 3-1. Lubrication order.

LUBRICANT • INTERVAL

INTERVAL • LUBRICANT



Compressor Crankcase Fill Plug (See Key) — 2190 TEP

Compressor Crankcase Drain Plug (Drain and refill) — 500

Compressor Crankcase Oil Level Sight Gage (Check level) — 10

Engine Air Cleaner (Refill oil reservoir to level mark; every 50 hours, disassemble entire unit, clean, re-oil and reassemble) (See Key) — OE 10

Generator (Sealed bearings, no lubrication required)

5 OE — Engine Crankcase Fill and Level Cap (See Key) (Check Level)

Starter (Sealed bearings, no lubrication required)

25 — Engine Crankcase Drain Plug (Drain and refill)

CAUTION: When OES oil is used the level will be checked more often.

MODEL BMW-452-ENG

and

MODEL BMW-452-ENG-1

FOLD

FOLD

-KEY-

LUBRICANT	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F.	0°F to -65°F	
2190-TEP LUBRICATING OIL, General Purpose		2190 TEP	2110 TH	2075 TH	Intervals given are in hours of normal operation.
Compressor Crankcase	2 1 2 qt ea				
OE - OIL, Engine, Heavy Duty		OE 30 or 9250	OE 10 or 9110	OES	
Engine Air Cleaner	1.5 qt ea				
Engine Crankcase	1 qt ea				
Oil Can Points					
OES—OIL, Engine, Sub-zero					

NOTES:

1. **FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F.** Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. **OIL CAN POINTS.** Every 50 hours lubricate control and all exposed adjusting threads with OE.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE
SECRETARY OF THE ARMY:

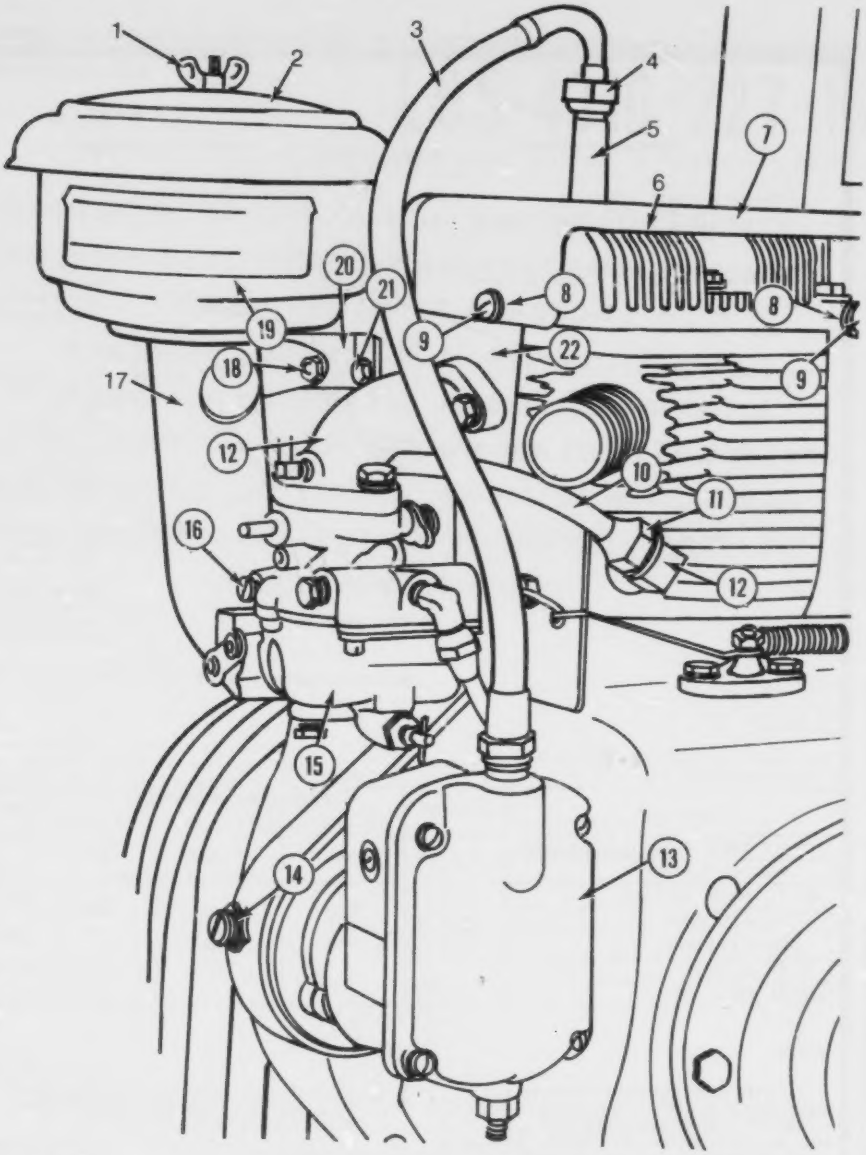
HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

OFFICIAL:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

MEC 4310-227-15 3-1 ②

Figure 3-1—Continued.



1 Wingnut, 1/4-20	12 Elbow
2 Cap and filter assembly	13 Ignition shield
3 Ignition cable	14 Inspection plug
4 Ignition cable terminal sleeve nut	15 Carburetor
5 Spark plug	16 Screw, mach. 1/4-20 x 1 in.
6 Cylinder head	17 Air cleaner bracket
7 Air shroud cover	18 Screw, cap, hex-hd, 1/4-28 x 1/2 in.
8 Washer, lock, 1/4 in. (4 rqr)	19 Oilcup
9 Screw, mach. 1/4-20 x 3/8 in. (4 rqr)	20 Bracket clip
10 Breather line	21 Screw, mach. 1/4-20 x 1/2 in.
11 Breather line coupling nut	22 Air shroud

Figure 3-2. Engine air cleaner and bracket, removal points.

(4) Position the gasket on the bracket (17). Position the gasket inside the oilcup (19).

(5) Fill the oilcup with clean oil to the oil level mark. Do not overfill. Refer to the current lubrication order for the proper lubricant.

(6) Position the cap and filter assembly (2) on the oilcup and place the air cleaner on the bracket. Secure the air cleaner with the wingnut (1).

e. *Compressor Air Cleaner.*

(1) Loosen the setscrew (2, fig. 3-3) in the intake manifold and remove the intake air cleaner from the low-pressure intake maifold (1).

(2) Remove the nut (3) and bolt (9).

(3) Remove the top (4) and bottom (8) from plate (5).

(4) Remove the screen (7) and element (6).

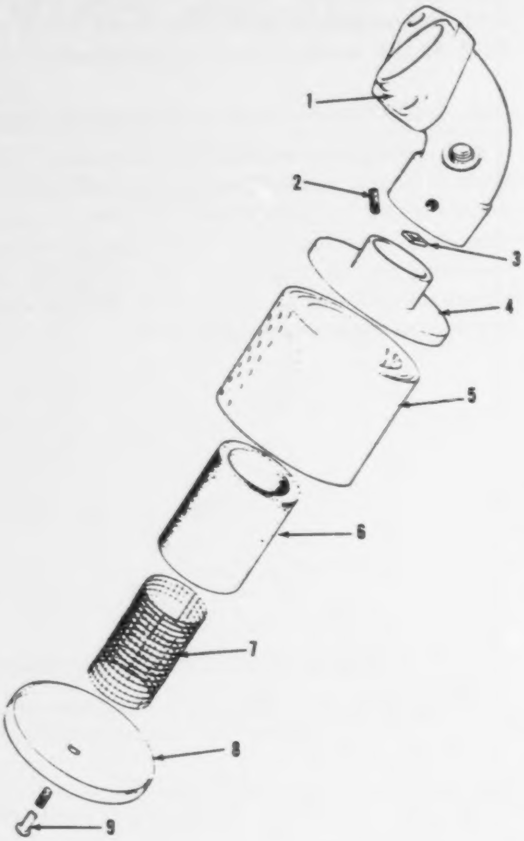
(5) Clean all parts with an approved cleaning solvent and dry thoroughly.

(6) Install the screen (7) and element (6) in plate (5).

(7) Install the top (4) and bottom (8).

(8) Install the bolt (9) and fasten nut (3).

(9) Install the air cleaner in the manifold (1) and tighten setscrew (2).



1 Manifold
2 Setscrew
3 Nut
4 Top
5 Plate
6 Element, scottfoam
7 Screen
8 Bottom
9 Bolt

Figure 3-3. Compressor air cleaner, exploded view.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-7. General

To insure that the air compressor is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3-8 and 3-9. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

3-8. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for the daily preventive maintenance services.

3-9. Quarterly Preventive Maintenance Services

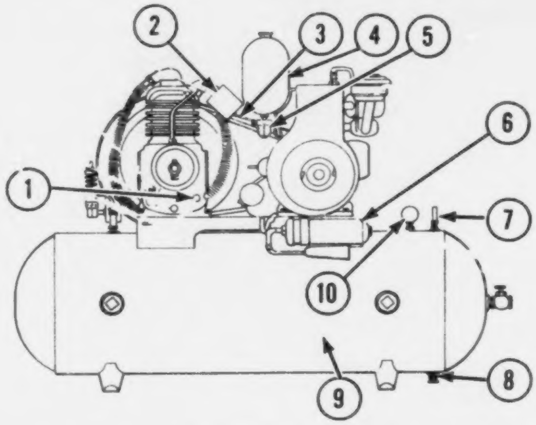
a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-5 for the quarterly preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES

DAILY

TM5-4310-227-15 CHAMPION PNEUMATIC MODEL OEG-458-ENG-1 COMPRESSOR AND MODEL OEG-458-ENG-2



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	OIL LEVEL GAGE. Add oil as indicated by level gage. Reference current L.O.	3-6
2	COMPRESSOR AIR CLEANER. Inspect for insecure mounting. Clean element. (Weekly).	3-72
3	DRIVE BELTS. Proper adjustment is a deflection of 1/2 inch midway between pulleys.	3-59
4	FUEL TANK. Add fuel as required.	3-35
5	FUEL STRAINER. Tighten thumbscrew if leaking. (Clean weekly)	3-34
6	FIRE EXTINGUISHER. Inspect for broken seal.	2-36
7	SAFETY RELIEF VALVE. Inspect for improper operation and insecure mounting. Maximum pressure is 185 psi.	2-24
8	DRAINCOCK. Inspect for leaks and damage. Make sure it is open before starting engine.	3-90
9	AIR RECEIVER. Inspect for leaks and damage. Drain condensate.	3-88

MEC 4310-227-15/3-4 (1)

Figure 3-4. Daily preventive maintenance services.

ITEM		PAR REF
10	CONTROLS AND INSTRUMENTS: Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for Instruments are as follows: Pressure Gage 140-175 psi	2-13
	NOTE 1. OPERATION: During operation observe for any unusual noise or vibration.	

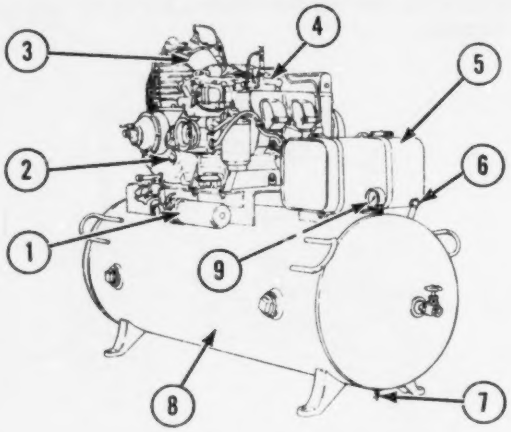
MEC 4310-227-15/3-4 ②

Figure 3-4—Continued.

PREVENTIVE MAINTENANCE SERVICES

DAILY

TM5-4310-227-15 CHAMPION PNEUMATIC MODEL OEG-458-ENG-3 COMPRESSOR



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	FIRE EXTINGUISHER. Inspect for broken seal.	2-36
2	OIL LEVEL GAGE. Add oil as indicated by level gage. Reference current L.O.	3-6
3	COMPRESSOR AIR CLEANER. Inspect for insecure mounting. Clean element. (Weekly).	3-72
4	DRIVE BELTS. Proper adjustment is a deflection of 1/2 inch midway between pulleys.	3-59
5	FUEL TANK. Add fuel as required.	3-35
6	SAFETY RELIEF VALVE. Inspect for improper operation and insecure mounting. Maximum pressure is 185 psi.	2-24
7	DRAINCOCK. Inspect for leaks and damage. Make sure it is open before starting engine.	3-90
8	AIR RECIEVER. Inspect for leaks and damage. Drain condensate.	3-88

MEC 4310-227-15/3-4 ③

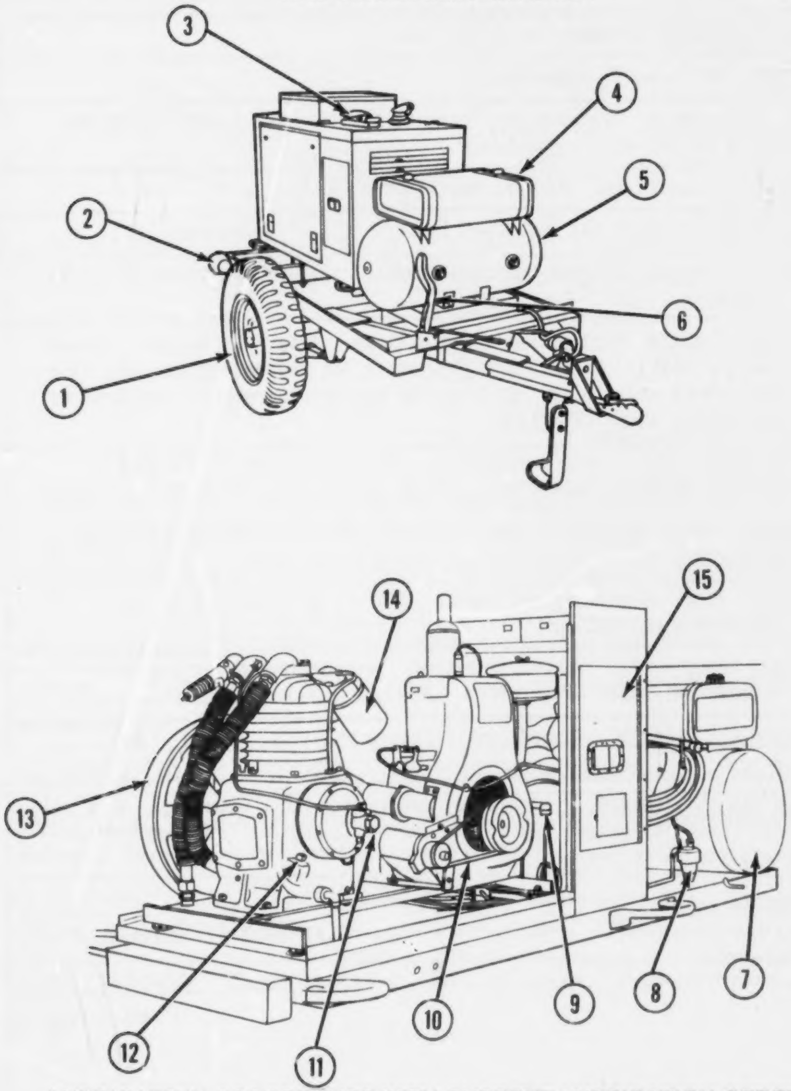
Figure 3-4—Continued.

ITEM		PAR REF
9	CONTROLS AND INSTRUMENTS: Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for instruments are as follows: Pressure Gage 140-175 psi	2-13
	NOTE 1. OPERATION: During operation observe for any unusual noise or vibration.	

MEC 4310-227-15/3-4 ④

Figure 3-4—Continued.

TM5-4310-227-15 CHAMPION PNEUMATIC MODEL BMW-452-ENG AND MODEL BMW-452-ENG-1 COMPRESSOR



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

Figure 3-4. Continued.

ITEM		PAR REF
1	TIRES AND WHEELS. Check for proper air pressure. Correct pressure is 45 psi. Inspect for cuts, wear. Inspect wheels for loose or missing mounting nuts. (Weekly)	
2	LIGHTS. Inspect for burned out lamps, cracked or broken lens.	
3	FIRE EXTINGUISHER. Inspect for broken seal.	
4	FUEL TANK. Add fuel as required.	
5	SAFETY RELIEF VALVE. Inspect for insecure mounting and proper operation. Max pressure is 185 psi.	
6	HAND BRAKE. Inspect for improper operation.	
7	AIR RECEIVER. Inspect for leaks and damage. Drain condensate.	
8	FUEL FILTER. Clean sediment bowl and screen. Tighten thumbscrew if gaskets leaks. (Weekly)	
9	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Inspect for cracks and leaks. Fill to 3/8 inch above the plates. Clean vent hole in filler cap before installing. In freezing weather run engine a minimum of 1 hour after adding water (Weekly).	
10	GENERATOR DRIVE BELT. Proper adjustment is a deflection of 3/4 inch midway between pulleys (Weekly).	
11	LEVEL GAGE. Check engine oil level. Add oil as indicated on level gage. Reference current L.O.	
12	FILL PLUG. Check compressor oil level. Add oil as indicated on sight glass. Reference current L.O.	
13	COMPRESSOR DRIVE BELTS. Proper adjustment is a deflection of 3/4 inch midway between pulleys. (Weekly)	
14	COMPRESSOR AIR CLEANER. Inspect for insecure mounting. Clean element (Weekly).	
15	CONTROLS AND INSTRUMENTS. Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for instruments are as follows: Ammeter — Slight positive charge Air pressure gage — 175 psi Hourmeter — Indicates total hours of operation Oil temperature — 195 to 200°F	

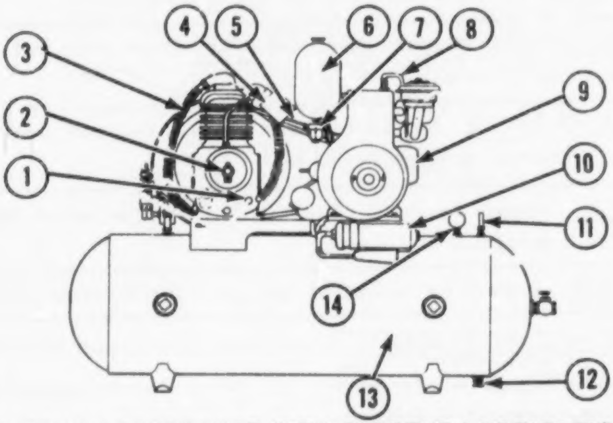
MEC 4310-227-15/3-4 ⑥

Figure 3-4—Continued.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM5-4310-227-15 CHAMPION PNEUMATIC MODEL OEG-458-ENG-1 COMPRESSOR AND MODEL OEG-458-ENG-2



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	OIL LEVEL GAGE. Add oil as indicated by level gage. Reference current L.O.	3-6
2	UNLOADER VALVE. Inspect for insecure mounting and proper operation.	3-83
3	AFTERCOOLER AND INTERCOOLER. Inspect for leaks, damage, and excessive dirt.	3-80
4	COMPRESSOR AIR CLEANER. Inspect for loose mounting. Clean element.	3-72
5	DRIVE BELTS Proper adjustment is a deflection of 1/2 inch midway between pulleys. Replace worn, frayed or cracked belt.	3-59
6	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap gasket. Clean cup vent.	3-35
7	FUEL STRAINER. Clean sediment bowl and screen. Tighten thumbscrew if gasket leaks.	3-34

MEC 4310-227-15/3-5 ①

Figure 3-5. Quarterly preventive maintenance services.

ITEM		PAR REF
8	SPARK PLUG. Replace a spark plug that has a cracked insulator or burned electrode. Clean and adjust spark plug gap to 0.30 inch. Torque spark plug to 25 foot-pounds. Replace a lead that is frayed or broken. Clean and tighten lead connections.	3-44
9	MAGNETO. Replace pitted or burned magneto points. Proper gap adjustment is 0.015 inch. (Check adjustment every 500 hours).	3-46
10	FIRE EXTINGUISHER. Inspect for broken seal. Inspect for full charge by shaking for sound or weight.	2-36
11	SAFETY RELIEF VALVE Inspect for insecure mounting and proper operation. Maximum pressure is 185 psi.	2-24
12	DRAINCOCK. Inspect for leaks. Make sure it is open before starting engine. Replace a defective draincock.	3-90
13	AIR RECEIVER Inspect for leaks and damage. Drain condensate.	3-88
14	CONTROLS AND INSTRUMENTS: Inspect for damage and loose mounting. With unit operating, check for proper operation. Normal operating readings for Instruments are as follows: Pressure Gage 140-175	2-13
	NOTE 1. OPERATIONAL TEST. During operation observe for any unusual noise or vibrations.	
	NOTE 2. ADJUSTMENTS. Make all necessary adjustments during operational tests.	

MEC 4310-227-15/3-5 ②

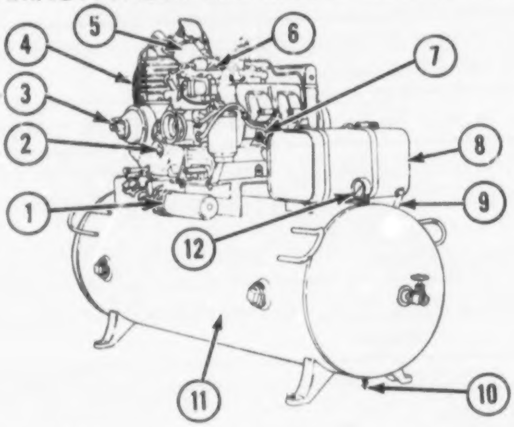
Figure 3-5—Continued.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM-4310-227-15 COMPRESSOR

CHAMPION PNEUMATIC MODEL OEG-458-ENG-3



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	FIRE EXTINGUISHER. Inspect for broken seal. Inspect for full charge by shaking for sound or weight.	2-36
2	OIL LEVEL GAGE. Add oil as indicated by level gage. Reference current L.O.	3-6
3	UNLOADER VALVE. Inspect for insecure mounting and proper operation.	3-83
4	AFTERCOOLER AND INTER COOLER. Inspect for leaks, damage and excessive dirt.	3-80
5	COMPRESSOR AIR CLEANER. Inspect for loose mounting. Clean element.	3-72
6	DRIVE BELTS. Proper adjustment is a deflection of 1/2 inch midway between pulleys. Replace worn, frayed, or cracked belt.	3-59
7	SPARK PLUGS. Replace a spark plug that has a cracked insulator or burned electrode. Clean and adjust spark plug gap to 0.30 inch. Torque spark plugs to 25 foot-pounds. Replace a lead that is frayed or broken. Clean and tighten lead connections.	3-44

MEC 4310-227-15/3-5 ②

Figure 3-5—Continued.

ITEM		PAR REF
8	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap gasket. Clean cup vent.	3-35
9	SAFETY RELIEF VALVE. Inspect for insecure mounting and proper operation. Maximum pressure is 185 psi.	2-24
10	DRAINCOCK. Inspect for leaks. Make sure it is open befor starting engine. Replace a defective draincock.	3-90
11	AIR RECEIVER. Inspect for leaks and damage. Drain condensate.	3-88
12	CONTROLS AND INSTRUMENTS: Inspect for damage and loose mounting. With unit operating, check for proper operation . Normal operating readings for Instruments are as follows; Pressure Gage 140-175	2-13
	NOTE 1. OPERATIONAL TEST. During operation observe for any unusual noise or vibrations.	
	NOTE 2. ADJUSTMENTS. Make all necessary adjustments during operational tests.	

MEC 4310-227-15/3-5 ④

Figure 3-5—Continued.

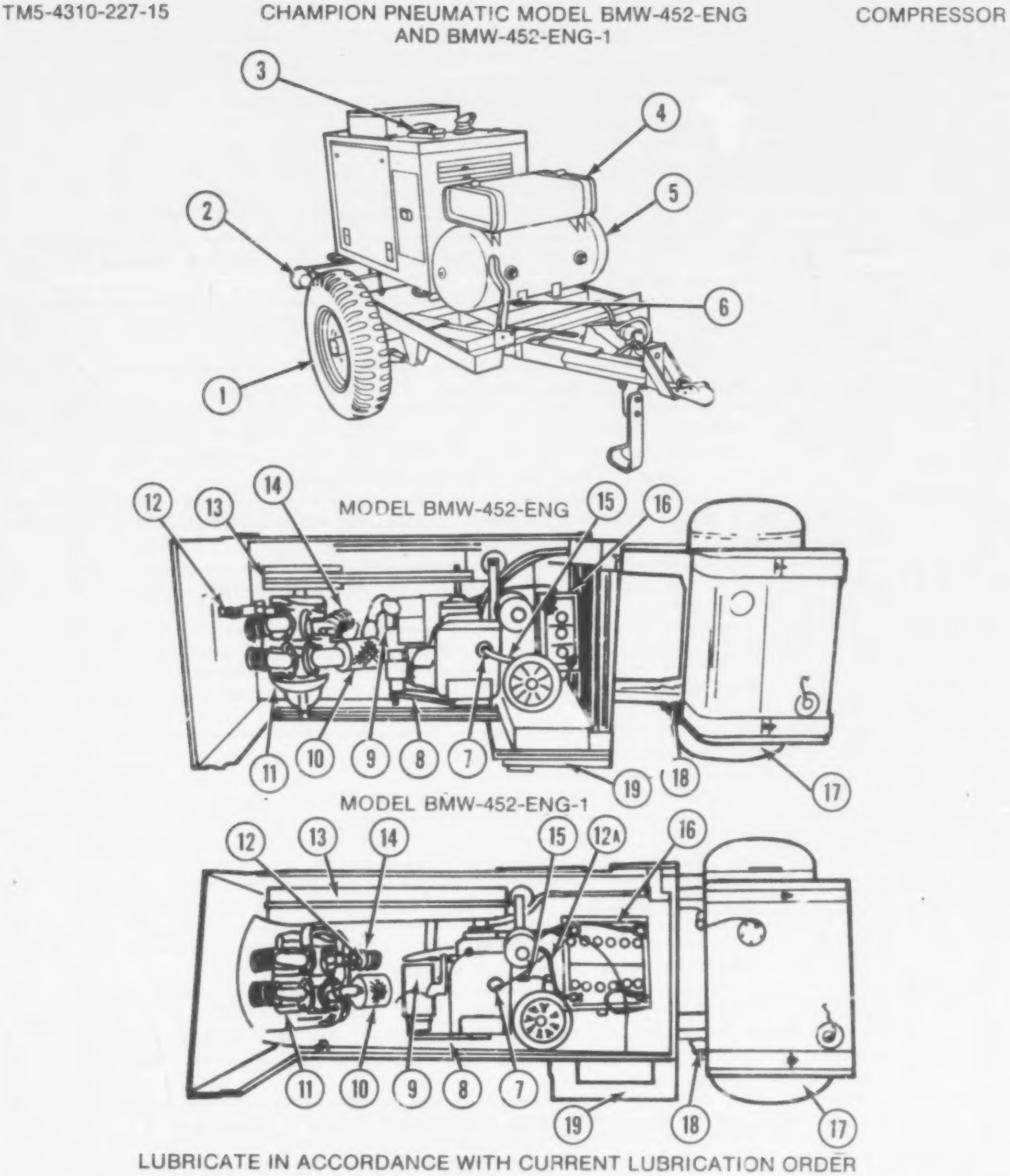


Figure 3-5. Continued.

ITEM		PAR REF
1	TIRES AND WHEELS. Check for proper air pressure. Correct pressure is 45 psi. Inspect for cuts, wear. Inspect wheels for loose or missing mounting nuts.	
2	LIGHTS. Inspect for burned out lamps, cracked or broken lens. Inspect for loose connections and broken leads.	
3	FIRE EXTINGUISHER. Inspect for broken seal. The dry chemical type must be weighed every 6 months. If the weight has decreased to less than 4 1/2 pounds or the pressure is below 125 psi, the extinguisher must be replaced.	
4	FUEL TANK. Add fuel as required. Tighten loose mounting. Replace leaking fuel tank. Replace defective cap gasket. Clean cap vent.	3-35
5	SAFETY RELIEF VALVE. Inspect for insecure mounting and proper operation. Max pressure is 185 psi.	2-24
6	HAND BRAKE. Inspect for improper operation. Adjust as necessary.	
7	SPARK PLUG. Replace a spark plug that has a cracked insulator or burned electrode. Clean and adjust spark plug gap to 0.030 inch. Replace a lead that is frayed or broken. Clean and tighten lead connections.	3-44
8	GENERATOR DRIVE BELT. Proper adjustment is a deflection 3/4 inch midway between pulleys. Replace a worn, frayed or cracked belt.	3-59
9	LEVEL GAGE. Check engine oil level. Add oil as indicated on level gage. Reference current L.O.	
10	COMPRESSOR AIR CLEANER. Inspect for insecure mounting. Clean element.	3-72
11	FILL PLUG. Check compressor oil level. Add oil as indicated on sight glass. Reference current L.O.	
12	UNLOADER VALVE. Inspect for insecure mounting and proper operation.	
12A	IDLING DEVICE. Inspect for insecure mounting and improper operation.	3-42
13	COMPRESSOR DRIVE BELTS. Proper adjustment is a deflection of 3/4 inch midway between pulleys. Replace worn, frayed or cracked belts.	3-59
14	AFTER COOLER AND INTER COOLER. Inspect for leaks, damage and excessive dirt.	
15	MAGNETO. Replace pitted or burned magneto points. Proper gap adjustment is 0.015 inch. (Check adjustment every 500 hours.)	3-46
16	BATTERIES. Tighten loose cables and mountings. Remove corrosion. Fill to 3/8 inch above the plates. Clean venthole in filler cap before installing. In freezing weather run engine minimum of 1 hour after adding water. Replace a cracked or leaking battery.	3-52
17	AIR RECEIVER TANK. Inspect for leaks and damage. Drain condensate.	3-68

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Figure 3-5—Continued.

ITEM		PAR REF
18	FUEL FILTER. Clean sediment bowl and screen. Tighten thumbscrew if gasket leaks.	3-36
19	CONTROLS AND INSTRUMENTS. Replace damaged instruments. Tighten loose mounting. With the unit operating, check for proper operation. Normal operating readings for instruments are as follows: Ammeter Slight positive charge Air pressure gage 175 psi Hourmeter Indicates total hours of operation Oil temperature 195 to 200°F	

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Figure 3-5—Continued.

Section IV. TROUBLESHOOTING

3-10. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the air compressor and its trouble. The possible remedy recommended is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any operational trouble that is beyond the scope of the operator or organizational maintenance must be reported to direct support maintenance.

3-11. Engine is Hard To Start or Fails to Start

Probable cause	Possible remedy
Ground switch pushbutton in grounded position	Pull out on pushbutton (para 2-22).
Fuel tank empty	Fill fuel tank (para 2-6).
Fuel shutoff valve closed	Open fuel shutoff valve.
Fuel mixture improper	Adjust the carburetor (para 3-37). Replenish fuel supply with correct grade of fuel. (Refer to appendix C).
Fuel strainer clogged	Service fuel strainer (para 3-36).
Carburetor clogged	Replace carburetor (para 3-37).
Cylinder flooded	Close the high speed adjustment valve, open governor control, and crank engine until excess fuel is removed.
Spark plug dirty or damaged	Clean, adjust, or replace spark plug (para 3-44).
Magneto contact set defective or out-of-adjustment	Adjust the contact set (para 3-46). Report defective contact set to the proper authority.
Magneto defectve	Replace magneto (para 3-46).
Ignition cable defective	Replace the ignition cable (para 3-45).
Magneto out of timing	Retime magneto (para 3-46).

3-12. Engine Misses or Runs Erratically

Probable cause	Possible remedy
Spark plug dirty or damaged	Clean, adjust, or replace spark plug (para 3-44).
Ignition cable loose or defective	Tighten or replace ignition cable (para 3-45).
Magneto contact set out-of-adjustment or defective	Adjust contact set (para 3-46). Report defective contact set to the proper authority.
Valve clearance incorrect	Adjust the valve clearance (para 4-25).
Carburetor out-of-adjustment or defective	Adjust or replace the carburetor (para 3-37).
Fuel strainer clogged	Service fuel strainer (para 3-36).
Choke partially closed	Open choke fully.
Airflow restriction	Service air cleaner (para 3-6). Provide proper ventilation.
Governor linkage out-of-adjustment	Adjust the governor linkage (para 3-39).
Unloader assembly out-of-adjustment or defective, and is overloading engine	Adjust or replace unloader assembly (para 3-83).
Fuel contains water	Drain fuel tank (para 3-36), and replenish fuel supply (para 2-6).

3-13. Engine Knocks

Probable cause	Possible remedy
Fuel of poor grade	Drain fuel tank para 3-36) and replenish fuel supply (para 2-6).
Oil level low	Fill to proper oil level (para 3-6).
Engine under heavy load at low speed	Open the governor control.
Ignition timing advanced too far	Retime ignition (para 3-46).

3-14. Engine Exhaust Smoke Excessive

Probable cause	Possible remedy
Carburetor out-of-adjustment or defective	Adjust or replace the carburetor (para 3-37).
Air cleaner dirty	Service air cleaner (para 3-6).
Fuel of poor grade	Drain fuel tank (para 3-36) and replenish fuel supply (para 2-6).

3-15. Engine Overheats

Probable cause	Possible remedy
Crankcase oil level low	Fill to proper level (para 3-6).
Airflow restricted	Provide adequate ventilation. Clean the cooling fins.
Fuel mixture too lean	Adjust the carburetor (para 3-37).
Exhaust system restricted	Clean or replace muffler and fitting (para 3-56).
Fuel of poor grade	Drain fuel tank (para 3-6) and replenish fuel supply (para 2-6).

3-16. Engine Backfires

Probable cause	Possible remedy
Fuel contains dirt or water	Drain fuel tank (para 3-6) and replenish fuel supply (para 2-6). Service strainer (para 3-6).
Fuel mixture too lean	Adjust the carburetor (para 3-37).
Timing incorrect	Rest timing (para 3-46).
Intake valve sticking	Remove spark plug and pour a small amount of penetrating oil into the engine block to loosen the valve.
Spark plug too hot	Install spark plug with correct heat range (para 3-44).

3-17. Engine Lacks Power

Probable cause	Possible remedy
Fuel strainer-to-carburetor tube restricted	Remove restriction or replace tube (para 3-34).
Fuel strainer clogged	Service fuel strainer (para 3-36).
Fuel mixture too lean	Adjust carburetor (para 3-37).
Ignition poor	Service or replace spark plug (para 3-44). Adjust the magneto contact set (para 3-46).
Air cleaner restricted	Service air cleaner (para 3-6).
Exhaust restricted	Remove and clean the muffler and nipple (para 3-56).
Timing improper	Reset timing (para 3-46).
Governor controls out-of-adjustment	Adjust the governor linkage (para 3-39).

3-18. Engine Stops Suddenly

Probable cause	Possible remedy
Fuel tank empty	Fill the fuel tank with the proper grade of fuel (para 2-6).
Fuel strainer clogged	Service fuel strainer (para 3-36).
Carburetor defective	Replace carburetor (para 3-7).
Fuel tank cap air vent hole plugged	Remove the restriction.
Air cleaner clogged	Service air cleaner (para 3-6).

3-19. Compressor Pumps Too Slowly

Probable cause	Possible remedy
Air cleaner clogged	Service the air cleaner (para 3-6).
V-belts improperly adjusted	Adjust the V-belts (para 3-59).
Oil level low	Measure oil level in crankcase and fill according to lubrication order.

3-20. Compressor Overheats

Probable cause	Possible remedy
Ventilation inadequate	Provide adequate ventilation around the unit.
Cylinder fins dirty	Clean the cylinder fins.
Intercooler and aftercooler tubes dirty	Clean the intercooler and after cooler tubes with brush and compressed air.
Oil level low	Add oil to the crankcase (para 3-6).
V-belts slipping	Adjust the V-belts (para 3-59).
Air cleaner dirty	Service the air cleaner (para 3-6).
Intake or exhaust valves faulty	Clean or replace the valves (para 3-82).

3-21. Compressor Fails To Build Up Pressure

Probable cause	Possible remedy
Air cleaner clogged	Service the air cleaner (para 3-6).
Intake and exhaust valves defective	Clean or replace the valve (para 3-82).
V-belts improperly adjusted	Adjust the V-belts (para 3-59).
Leaks in air lines and fittings	Tighten the connections.

Probable cause	Possible remedy
Leak in intercooler or aftercooler tubes	Replace the intercoolers or aftercoolers (paras 3-80 and 3-81).
Piston rings or piston worn	Replace the compressor assembly (para 3-62).

3-22. Compressor Noisy

Probable cause	Possible remedy
Oil level too low	Add oil to the crankcase (para 3-6).
Pulley loose	Tighten the pulley (para 3-66).
V-belts worn	Replace the V-belts (para 3-59).

3-23. V-Belts Worn Excessively

Probable cause	Possible remedy
Pulley out of alinement	Aline the pulley (para 3-59).
V-belts too tight or too loose	Adjust the V-belts (para 3-59).
Oil or grease on V-belts	Clean or replace the V-belts (para 3-59).

3-24. Compressor Vibrates Excessively

Probable cause	Possible remedy
Mounting insecure	Tighten the mounting bolts.
Pulley out of line	Inspect and adjust the alinement of the pulley (para 3-59).
Foundation insecure	Strengthen the foundation or relocate the air compressor on a solid base.

3-25. Field Expedient Repairs

Operational troubles may occur while the air compressor is operating in the field where supplies and repair parts are not available and normal remedial action cannot be performed. When this condition exists, the expedient remedies listed below may be used only upon the decision of the unit commander. Equipment so repaired must be removed from operation at the earliest possible moment and properly repaired before being placed in operation again.

Trouble	Expedient remedy
Compressor air cleaner clogged	Remove the air cleaner (para 3-72).
Engine air cleaner clogged	Remove the air cleaner (para 3-38).

***Caution*: Operating the unit in sandy or dusty area without an air cleaner can cause damage to the engine or compressor.**

Trouble	Expedient remedy
Fuel strainer clogged	Bypass fuel strainer (para 3-36).

***Caution*: Operating the unit with dirty fuel and no fuel strainer in the system can result in engine stoppage and damage to the carburetor.**

Section V. RADIO INTERFERENCE SUPPRESSION

3-26. Definitions

a. Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the air compressor and which may interfere with the proper operation of radio receivers or other electronic equipment.

b. Interference Suppression. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the air compressor.

3-27. Purpose of Interference Suppression

The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbances generated by the air compressor are composed partly of electrical waves in the radio frequency range, they must be suppressed for two important reasons. First, they will interfere with the proper operation of the friendly radio set, and second, they will enable the enemy to locate the equipment and its associated units.

3-28. General Sources of Interference

Generally, radio interference is generated anywhere a spark occurs or where a high-frequency current is present. A spark is a small amount of current jumping an airgap in response to the force of a relatively high voltage.

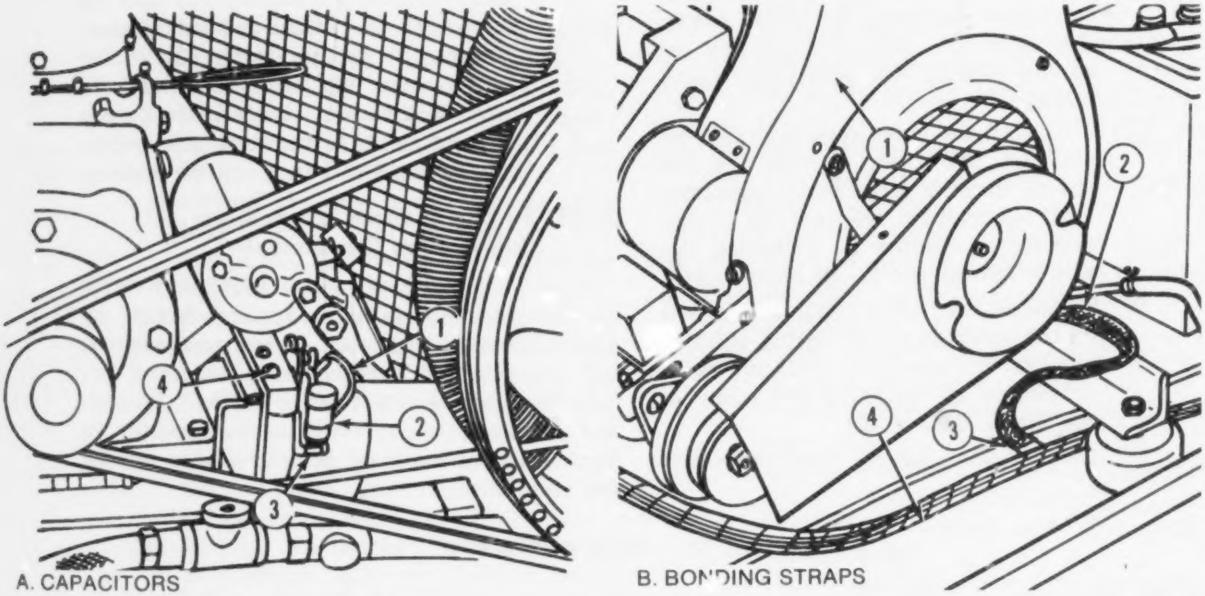
The gasoline engine ignition system is a common source. Magneto breaker points, generator commutators, relay contacts, and static charges collecting on the frame are other common sources which in some way must be suppressed.

3-29. General Methods Used To Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wire, grounding the frame with bonding straps, and using capacitors and resistors where necessary.

3-30. Interference Suppression Components

a. Primary Suppression Components. The primary suppression components are those whose primary function is to suppress radio interference. These components are described and located in figure 3-6.



A. CAPACITORS

B. BONDING STRAPS

A—Capacitors
1 Electrical lead
2 Capacitor, 0.1 us, 100-v dc (3 rqr)
3 Shock mount
4 Screw

B—Bonding straps
1 Air shroud
2 Ground strap
3 Nut
4 Bottom pan

Figure 3-6. Radio interference suppression components, removal points.

b. Secondary Suppression Components. These components have radio interference suppression functions which are incidental and/or secondary to their primary function.

3-31. Replacement of Suppression Components

a. General. Air compressor, model OEG-458-ENG-1 is not radio suppressed; model OEG-458-ENG-2, the spark plug, which is located on top of the engine cylinder head is integrally shielded and radio interference suppressed. The ignition cable assembly is connected to the magneto and spark plug. The cable is insulated and enclosed in metal braided shielding, which is grounded at the spark plug and magneto connections; model BMW-452-ENG utilizes three capacitors (2, A, fig. 3-6) and a ground strap; model BMW-452-ENG-1 utilizes two ground straps (B, fig. 3-6); Refer to TM 5-2805-203-14 for suppression components applicable to model OEG-458-ENG-3.

b. Capacitors and Ground Strap (Model BMW-452-ENG).

(1) Tag and disconnect electrical leads (1A) as necessary.

(2) Remove the two screws (4) and five lockwashers that secure the capacitors (2) to the shock mount (3) and remove the capacitors.

(3) To remove the remaining capacitor and the ground strap, it is necessary to remove the generator (para 3-49).

(4) To install the ground strap and capacitor, install the generator (para 3-49).

(5) To install the outer capacitor (2), install on the screw (4) in the following order a lockwasher, capacitor (2), lockwasher, ground lead, and lockwasher. Secure by installing the screw (4) on the shock mount (3).

(6) To install the inner capacitor, install on the screw in the following order, a lockwasher, capacitor, and lockwasher. Secure by installing the screw in the shock mount (3).

(7) Connect the tagged electrical leads (1).

c. Ground Straps (Model BMW-452-ENG-1.

(1) Remove the nut (3, B, fig. 3-6) and lockwasher that secures the ground strap (2) to the bottom pan (4).

(2) Remove the screw and lockwasher that secures the ground strap (2) to the flywheel air shroud (1) and remove the ground strap. Remove the other ground strap from the dust end enclosure (para 3-60) in a similar manner.

(3) Position the ground strap (2, B, fig. 3-6) on the air shroud (1) and secure with the screw and lockwasher.

(4) Secure the ground strap (2) to the bottom pan (4) with the nut (3) and lockwasher. Install the other ground strap to the dust end enclosure (para 3-60) in a similar manner.

3-32. Testing of Radio Interference Suppression Components

Test the capacitors, model BMW-452-ENG, for leaks and shorts on a capacitor tester; replace defective capacitors. If test equipment is not available and interference is indicated, isolate the cause of interference by the trial-and-error method of replacing each capacitor in turn until the cause of interference is located and eliminated.

Section VI. FUEL SYSTEM

3-33. General

The fuel system consists of a fuel tank, fuel strainer, fuel pump, carburetor, air cleaner, air cleaner bracket, governor control assembly, and governor. The fuel is gravity fed from the fuel tank through the fuel strainer. The strainer provides a means of removing water and foreign matter from the fuel and, through a shutoff valve, provides means for regulating the flow of fuel to the carburetor. The carburetor mixes the fuel with air which has been filtered through the oil bath air cleaner. The fuel and air mixture then passes into the engine combustion chamber and is ignited by the spark plug. Governor controls are used to regulate the carburetor throttle and the engine speed.

3-34. Fuel Strainer-To-Fuel Pump Tube

a. Removal.

(1) Turn the fuel shutoff valve (18, fig. 2-6) to the off position.

(2) Disconnect the fuel strainer-to-fuel pump tube (17, fig. 2-6) from the fuel strainer outlet elbow (16) and from the fuel pump elbow (42, fig. 2-7). Remove the tube. Remove other tubes in a similar manner.

b. Cleaning, Inspection, and Repair.

(1) Clean the tube in an approved cleaning solvent and dry thoroughly.

(2) Blow compressed air through the tube to remove any dirt or foreign matter.

(3) Inspect the tube for bends, cracks, and other damage. Inspect the fittings for damaged threads. Repair or replace a defective fuel line.

c. Installation.

(1) Position the fuel strainer-to-fuel pump tube (17, fig. 2-6). Connect the tube to the fuel pump elbow (42, fig. 2-7) and to the fuel strainer outlet elbow (16, fig. 2-6). Install other tubes in a similar manner.

(2) Turn the fuel shutoff valve (18) to the on position.

3-35. Fuel Tank, Bracket, and Straps

a. Removal and Disassembly (Models OEG-458-NEG-1 and OEG-458-ENG-2).

(1) Remove the fuel strainer (para 3-36).

(2) Remove the two screws (11, fig. 2-8), lockwashers (12), and nuts (13) that secure the two fuel tank straps (10) around the fuel tank (9) and fuel tank bracket (14). Remove the two straps and lift the fuel tank from the bracket.

(3) Remove the air shroud cover (2).

(4) Remove the two capscrews (16) and lockwashers (17) that secure the bracket to the cylinder and crankcase assembly (19). One of these capscrews also secures the governor control bracket brace (18) to the cylinder and crankcase assembly (19).

(5) Remove the bracket from the engine and remove the two leather liners (6) from the bracket (14).

(6) Remove the fuel tank cap (8) and detach the cap from the chain (7). Remove the chain from the fuel tank.

(7) Remove the retainer ring from inside the fuel tank filler neck and remove the fuel tank strainer from the tank.

(8) Remove the fuel strainer pipe nipple (1, fig. 2-4) from the bottom of the fuel tank (2).

b. Removal and Disassembly (Model OEG-458-ENG-3).

(1) Remove fuel strainer (para 3-36).

(2) Remove screws (7, fig. 2-5) and nuts (8) that secure the two fuel tank straps (9) around fuel tank (6) and fuel tank bracket. Remove fuel tank.

(3) Remove fuel tank cap (4) and detach cap from chain. Remove chain from fuel tank.

(4) Remove gasket (3) from filler neck and remove screen (5) from fuel tank.

c. Removal and Disassembly (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Remove drain plug (19, fig. 2-6) and drain fuel into a suitable container.

(2) Remove the two screw (4, fig. 2-6), lockwasher (2), flat washers (1) and nuts (3) that secure the two fuel tank straps (5) around the fuel tank (22).

(3) Remove the four screws (9), nuts (8), and lockwashers (7) that secure the straps (5) to the fuel tank brackets.

(4) Remove the wires.

(5) Lift the fuel tank from the brackets.

d. Cleaning, Inspection, and Repair.

(1) Clean the inside and outside of the fuel tank and all applicable parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the fuel tank, fuel tank strainer, and mounting components for cracks, breaks, dents, and other damage.

(3) Inspect the fuel tank cap and gasket for wear and deterioration.

(4) Inspect all threaded parts for damaged threads.

(5) Repair or replace any defective parts as necessary.

e. Reassembly and Installation (Model OEG-458-ENG-1 and OEG-458-ENG-2).

(1) Install the fuel strainer pipe nipple (1, fig. 2-4) in the bottom of the fuel tank (2).

(2) Position the fuel tank strainer inside the fuel tank and install the retainer ring.

(3) Attach the chain (7, fig. 2-8) to the fuel tank (9). Attach the fuel tank cap (8) to the chain and install the cap.

(4) Position the bracket (14) on the cylinder head stud (4) and secure the

bracket and governor control bracket brace (18) to the cylinder and crankcase assembly (19) with the two capscrews (16) and lockwashers (17).

(5) Install the air shroud cover (2).

(6) Position the two leather liners (6) and fuel tank on the bracket. Position the two straps (10) around the fuel tank and bracket and install the two screws (11), lockwashers (12), and nuts (13) that secure the straps (10).

(7) Install the fuel strainer (para 3-36).

f. Reassembly and Installation (Model OEG-458-ENG-3).

(1) Position screen (5, fig. 2-5) inside fuel tank and install gasket (3).

(2) Attach chain to fuel tank (6). Attach fuel tank cap (4) to chain and install cap.

(3) Position fuel tank on bracket. Position the two fuel tank straps (9) around bracket and tank and install screws (7) and nuts (8).

(4) Install the fuel strainer (para 3-36).

g. Reassembly and Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Place the fuel tank and the straps in the brackets.

(2) Replace the wires.

(3) Install the four screws (9, fig. 2-6), nuts (8), and lockwashers (7) that fasten the straps (5) to the brackets.

(4) Install the two screws (4), lockwashers (2), flat washers (1) and nuts (3) that secure the two fuel tank straps to the fuel tank.

(5) Install drain plug (19) and replenish fuel tank with proper grade of fuel.

3-36. Fuel Strainer

a. Removal and Disassembly.

(1) Turn the fuel shutoff valve (3, fig. 2-4) to the off position. Disconnect the fuel strainer - to - carburetor tube (10) from the fuel strainer outlet elbow (12). Open the fuel shutoff valve and drain the fuel from the fuel tank (2) into a suitable container.

(2) Remove the fuel strainer from the fuel tank pipe nipple (1).

(3) Remove the fuel strainer outlet elbow from the fuel strainer.

(4) Loosen the knurled nut (9) and separate the bail (6), sediment bowl (11), gasket, and screen from the fuel strainer cover (5). Remove the knurled nut from the bail screw and bail screw nut (7) from the bail.

(5) Remove the shutoff valve packing nut (4) and valve (3) from the fuel strainer cover. Remove the needle valve from the packing nut. Remove the valve packing from the strainer cover.

b. Cleaning, Inspection, and Repair.

(1) Clean all applicable parts in an approved cleaning solvent and dry thoroughly. Blow out the fuel strainer cover and screen with compressed air if available.

(2) Inspect all applicable parts for cracks, breaks, and other damage. Inspect the needle valve and fittings for cracks, breaks, and damaged threads.

(3) Replace a defective bowl and gasket.

c. Reassembly and Installation.

(1) Install the fuel shutoff valve (3) in the packing nut (4) and install the valve, packing nut, and packing in the strainer cover (5). Tighten the packing nut.

(2) Install the bail screw (8), bail screw (7), and knurled nut (9) in the bail (6). Position the screen, gasket, and sediment bowl (11) in the strainer cover and secure by installing the bail and tightening the knurled nut.

(3) Install the fuel strainer outlet elbow (12) in the strainer cover.

(4) Install the fuel tank pipe nipple (1) in the bottom of the fuel tank (2).

(5) Install the fuel strainer on the fuel tank pipe nipple. Connect the fuel strainer - to - carburetor tube (10) to the fuel strainer outlet elbow. Replenish the fuel tank with the proper grade of fuel.

d. Field Expedient Repairs. If the engine fails to start or stops due to a clogged or defective fuel strainer, remove the fuel strainer (see *a* above). Correct the fuel strainer - to - carburetor tube to the fuel tank outlet nipple and operate the unit without the fuel strainer.

Caution: **Operating the unit with dirty fuel and no fuel strainer in the system can result in engine stoppage and damage to the carburetor.**

3-37. Carburetor

a. Removal.

(1) Loosen the screw (32, fig. 2-7) that secures the air cleaner bracket (30) to the carburetor (36).

(2) Disconnect the fuel pump-to-carburetor tube (9) from the elbow (8).

(3) Remove the governor control rod (para 3-39) or disconnect governor control and choke (para 3-40).

(4) Remove the two bolts (5) and lockwashers (6) that secure the carburetor (36) to the intake manifold (4). Remove the carburetor and gasket.

(5) Remove the carburetor fuel inlet elbow (8).

b. Cleaning, Inspection, and Repair.

(1) Clean the carburetor with a clean cloth dampened with an approved cleaning solvent.

(2) Inspect the carburetor for loose or missing mounting bolts between the upper and lower sections.

(3) Inspect the carburetor for cracks and breaks. Test the throttle for excessive play and freedom of movement.

(4) Inspect the mounting gasket for serviceability. Replace all missing or defective parts. Replace a defective carburetor.

c. Installation.

(1) Install the carburetor fuel inlet elbow (8).

(2) Position the carburetor (36) on the air cleaner bracket (30) and secure the carburetor and gasket to the intake manifold (4) with the two lockwashers (6) and bolts (5).

(3) Install the governor control rod (para 3-39) or connect governor control and choke (para 3-40).

(4) Connect the fuel pump-to-carburetor tube (9) to the elbow (8).

(5) Tighten the screw (32) that secures the air cleaner bracket (30) to the carburetor.

d. Adjustment.

(1) Obtain the initial adjustment as follows:

(*a*) Close the idle adjustment needle valve (7).

Caution: **Do not tighten the needle valve. If force is applied, damage to the valve and carburetor body will result.**

(*b*) From the closed position, open the idle adjustment needle valve three-quarters of a turn.

(*c*) Close the high speed adjustment valve (10). Observe the caution in (*a*) above.

(*d*) From the closed position, open the high-speed adjustment valve one turn.

(2) Start the engine (para 2-26).

(3) When the engine is warm, place the governor adjusting lever (15, fig. 2-8) in the idle position.

(4) Adjust the idle adjustment needle valve (7, fig. 2-7) to a point just above where the engine will stall.

(5) Place the governor adjusting lever in the operating position.

(6) Slowly close the high-speed adjustment valve (10) until the engine begins to falter. Slowly open the high-speed adjustment valve until the engine runs smoothly.

Note. The high-speed adjustment valve does not require frequent adjustment. Once the proper adjustment has been obtained, do not readjust the valve unless the adjustment has been disturbed.

3-38. Engine Air Cleaner and Bracket

a. Removal and Disassembly.

(1) Remove the engine air cleaner (para 3-6).

(2) Disconnect the engine breather line (10, fig. 3-2) from the air cleaner bracket breather line elbow (12).

(3) Remove the capscrew (18) that secures the air cleaner bracket (17) to the bracket clip (20).

(4) Loosen the screw (16) that secures the bracket to the carburetor (15) and remove the bracket.

(5) Remove the screw (32, fig. 2-7) and bracket clamp gasket (33) from the bracket (30).

(6) Remove the breather line elbow (12, fig. 3-2) from the bracket (17).

b. Cleaning and Inspection.

(1) Clean all applicable metal parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect all applicable parts for cracks, breaks, and other damage.

(3) Inspect the bracket gasket for unserviceable condition.

(4) Replace all defective parts.

c. Reassembly and Installation.

(1) Install the breather line elbow (12, fig. 3-2) in the bracket (17).

(2) Position the bracket clamp gasket (33, fig. 2-7) in the bracket and loosely install the screw (32).

(3) Position the bracket (17, fig. 3-2) on the carburetor (15) and tighten the bracket screw (16).

(4) Install the capscrew (18) that secures the bracket assembly to the bracket clip (20).

(5) Connect the breather line (10) to the bracket breather line elbow.

(6) Install the engine air cleaner (para 3-6).

d. Field Expedient Repairs. If the engine fails to start or stops suddenly due to a clogged air cleaner, remove the air cleaner (see *a* above). Securely fasten a suitable section of clean, fine, meshed screen, if available, over the open end of the air cleaner bracket and operate the engine without the air cleaner.

Caution: Operating the unit in sandy or dusty areas without the air cleaner can cause damage to the engine.

3-39. Governor Control Assembly

a. Removal and Disassembly.

(1) Disconnect the extension spring (44, fig. 2-8) from the spring adjusting screw (40).

(2) Remove the cotter pin (26) and disconnect the governor control rod (27) from the governor control lever (25). Remove the control rod from the carburetor throttle shaft swivel block (28).

(3) Remove the nut (43) that secures the control level to the governor yoke and support bracket (23). Remove the control lever and extension spring. Remove the extension spring from the control lever.

Note. Tag the hole in the control lever from which the extension spring is removed to facilitate proper reassembly.

(4) Remove one of the locknuts (41) from the spring adjusting screw (40) and remove the adjusting screw from the swivel block (45). Remove the remaining locknut from the adjusting screw.

(5) Remove the cotter pin (37) that secures the flat washer (46), compression spring (38) and governor adjusting lever (15) on the support pin (47). Remove the flat washer, compression spring, and adjusting lever from the support pin.

(6) Loosen the capscrew (16) that secures the control bracket brace (18) against the control bracket (39) and cylinder and crankcase assembly (19).

(7) Remove the countersunk screw and IET lockwasher that secure the control bracket to the engine crankcase and remove the control bracket and gasket.

(8) Remove the support pin from the bracket.

(9) Remove the flat washer (42) and remove the swivel block (45) from the adjusting lever (15).

b. Cleaning and Inspection.

(1) Clean all applicable parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, and other damage. Inspect the control lever for excessive wear.

(3) Examine the springs for distorted coils and weak tension.

(4) Inspect the fit of the swivel block in the adjusting lever. It should operate freely without excessive play.

(5) Replace all defective parts.

c. Reassembly and Installation.

(1) Secure the swivel block (45) and flat washer (42) to the adjusting lever (15) by peening the end of the swivel block.

(2) Position the support pin (47) in the control bracket (39).

(3) Secure the control bracket to cylinder and crankcase assembly (19) with the countersunk screw and IET lockwasher.

(4) Tighten the capscrew (16) that secures the control bracket brace (18) against the control bracket and crankcase.

(5) Position the adjusting lever (15), compression spring (38), and flat washer (46) on the support pin (47) and secure with the cotter pin (37).

(6) Position one of the nuts (41) on the spring adjusting screw (40). Position the adjusting screw in the swivel block (45) and install the other locknut.

(7) Install the extension spring (44) on the governor control lever (25) and secure the lever to the governor yoke and support bracket (23) with the nut (43).

Note. Be sure to install the extension spring on the control lever in the same hole from which it was removed.

(8) Install the control rod (27) in the throttle shaft swivel block (28) and adjust as in *d* below. Secure the control rod in the control lever with the cotter pin (26).

(9) Connect the extension spring to the adjusting screw.

d. Adjustment. Since the speed of the engine is regulated by the governor controls, a tachometer must be used to obtain the correct engine speed while the governor controls are being adjusted.

(1) Disconnect the control rod from the control lever as described in *a* above.

(2) Open the carburetor throttle as far as possible. Hold the control lever in the full open position. With the control rod and control lever in this position, adjust the rod until it will exactly aline with the hole in the control lever.

(3) Connect the control rod to the control lever as described in *c* above.

(4) Make sure the extension spring is positioned in the third hole in the control lever.

(5) Attach a tachometer to the engine in accordance with instructions furnished with the instrument.

(6) Start the engine and allow it to warm up (para 2-26).

(7) Place the governor adjusting lever in the full open position. The tachometer should indicate an rpm of 2,625 with load. The rpm will vary without load from 100 to 190 rpm higher than the rpm with load.

(8) Adjust the two locknuts on the adjustment screw until the desired reading is obtained on the tachometer. More tension on the spring increases rpm; less tension decreases rpm.

(9) When the correct rpm is obtained, tighten the locknuts and recheck the indicated rpm.

(10) Stop the engine and remove the tachometer (para 2-27).

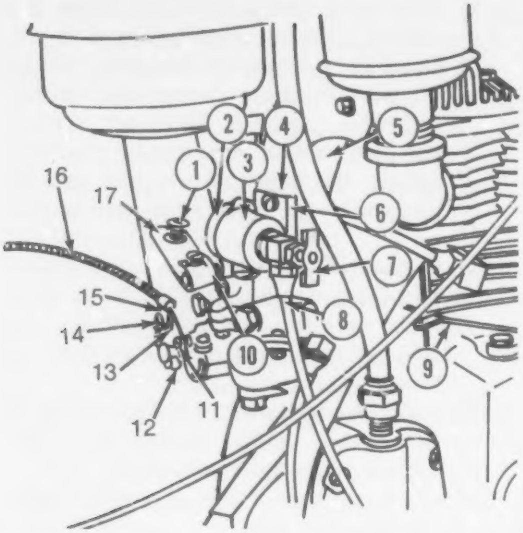
3-40. Choke Control and Governor Control

a. Choke Control Removal (Models BMW-452-ENG and BMW-452-ENG-1.

(1) Loosen the screw (11, fig. 3-7) and disconnect the choke wire (13) from the choke arm (12).

(2) Loosen the screw (14) and disconnect the cable (16) from the bracket (15).

(3) Remove the nut that secures the choke control (20, fig. 3-8) to the rear of the instrument panel (10) and remove the choke control from the front of the instrument panel.



1 Screw
2 Plunger
3 Idling device
4 Screw
5 Intake manifold
6 Mounting bracket
7 Shutoff cock
8 Air tube
9 Governor arm
10 Throttle shaft
11 Screw
12 Choke arm
13 Choke wire
14 Screw
15 Bracket
16 Choke cable
17 Control arm

Figure 3-7. Choke control cable and idling device, model BMW-452-ENG-1, removal points.

b. Governor Control Removal (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Remove the screws that secures the clamps (9, fig. 3-9) to the rim (10).

(2) Disconnect the spring (25, fig. 3-10) from the governor control (27) and link (1) and remove the spring.

(3) Loosen the screw and remove the the link (1).

(4) Loosen the screw (2) on the stop (24) and remove the stop.

(5) Loosen the screw (3) that secures the governor control (4) to the bracket (23). Remove the governor control from the bracket.

(6) Remove the nut and lockwasher that secures the governor control (22, fig. 3-8) to the rear of the instrument panel (10) and remove the governor control from the front of the instrument panel.

(7) Remove the screw and lockwasher that secures the bracket (23) to the engine (26) and remove the bracket.

c. Cleaning and Inspection.

(1) Clean all parts with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the choke control and governor control for breaks, excessive bends, broken or cracked knob, damaged threads, and other damage.

(3) Inspect the remaining parts for cracks, damaged threads, and other damage.

(4) Replace all damaged parts.

d. Choke Control Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Install the choke control (20, fig. 3-8) through the front of the instrument panel (10) and secure with the nut at the rear of the instrument panel.

(2) Position the cable (16, fig. 3-7) on the bracket (15) and secure with the screw (14).

(3) Connect the choke wire (13) to the choke arm (12). Be sure the choke control (3, fig. 2-2) is pushed completely in. Manually place the choke arm (12, fig. 3-7) in the full open position and tighten the screw (11).

e. Governor Control Installation (Models BMW-452-ENG and BMW-452-ENG-1).

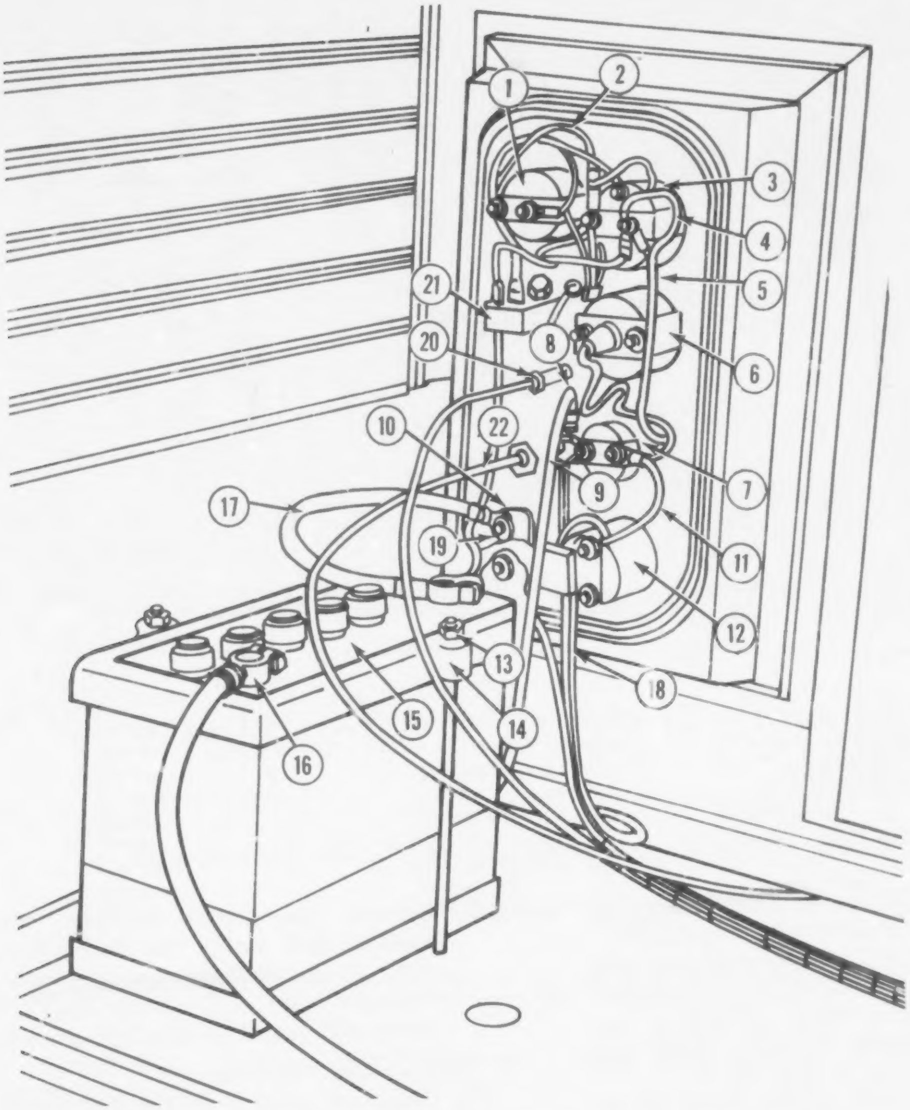
(1) Position the bracket (23, fig. 3-10) on the engine (26) and secure with the screw and lockwasher.

(2) Install the governor control (22, fig. 3-8) through the front of the instrument panel (10) and secure with the nut and lockwasher at the rear of the instrument panel.

(3) Install the governor control (4, fig. 3-10) through the hole in bracket (23) and secure by tightening screw (3).

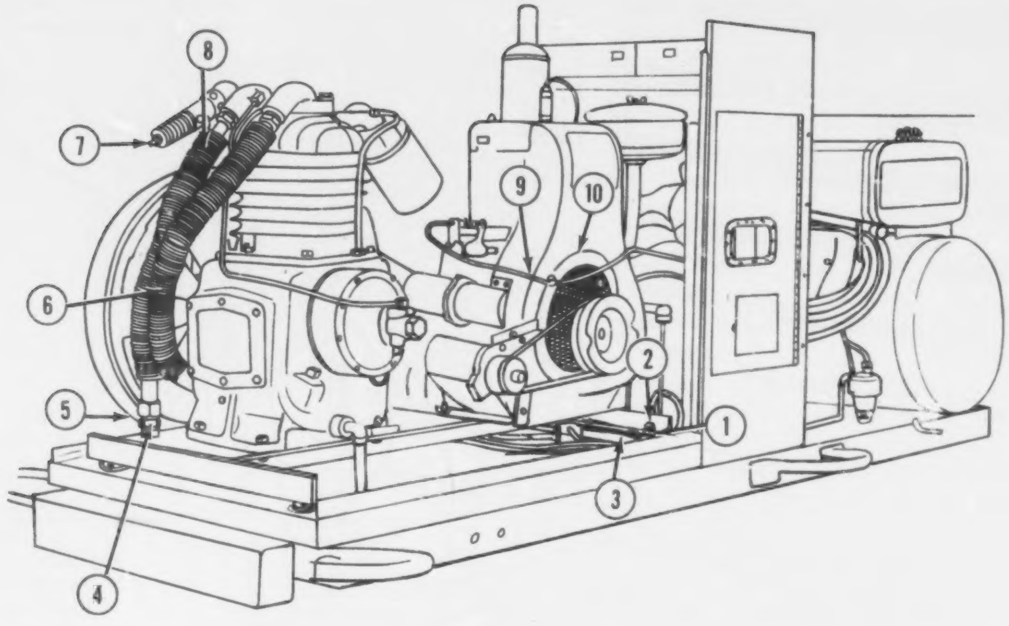
(4) Install the stop (24) on the governor control (4).

(5) Loosely install the link (1) on the end of the governor control (4).



1	Ammeter
2	Wire
3	Fuel gage
4	Wire
5	Cable
6	Pressure gage
7	Temperature gage
8	Adapter
9	Tubing
10	Instrument panel
11	Cable
12	Hourmeter
13	Nut
14	Frame
15	Battery
16	Cable
17	Cable
18	Wire
19	Start button
20	Choke control
21	Stop button
22	Governor control

Figure 3-8. Battery, cables, controls, and instruments, removal points.



1 Nut
2 Bolt
3 Base
4 Elbow
5 Adapter
6 Aftercooler
7 Unloader valve
8 Elbow
9 Clamp
10 Rim

Figure 3-9. Compressor and engine assembly, model BMW-452-ENG, removal points.

(6) Connect the spring (25) to the link (1) and the governor control (27).

(7) With the knob of the governor control (9, fig. 2-2) in the full in position, place a slight amount of tension on spring (25, fig. 3-10) and tighten screw on link (1).

3-41. Fuel Pump

a. Removal (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Close the fuel shutoff valve (18, fig. 2-6).

(2) Disconnect the fuel pump - to - carburetor tube (9, fig. 2-7) and fuel strainer-to-fuel pump tube (41) from the fuel pump (43).

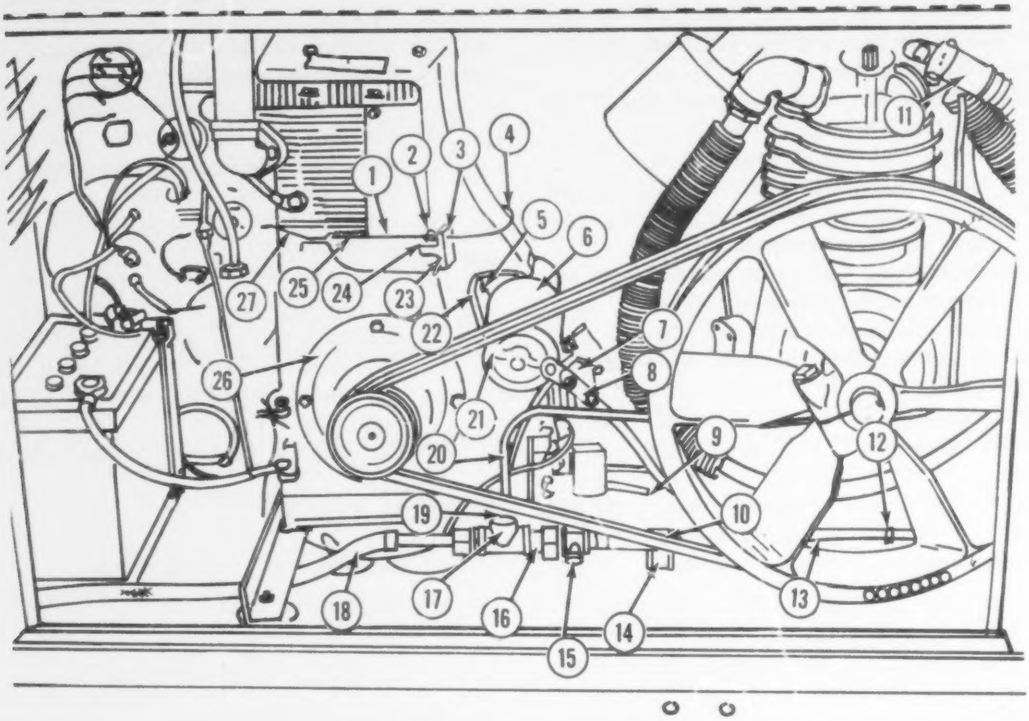
(3) Remove the screws (19) and lockwashers that secure the fuel pump (43) to the cylinder and crankcase assembly (18) and remove the fuel pump and gasket. Discard the gasket.

b. Cleaning and Inspection.

(1) Clean the exterior of the fuel pump with a cloth dampened with an approved cleaning solvent and dry thoroughly. Be sure all gasket material is removed from the fuel pump and cylinder and crankcase assembly.

(2) Inspect the fuel pump for cracks, evidence of leakage, and other damage.

(3) Replace a damaged fuel pump.



1 Link
2 Screw
3 Screw
4 Governor control
5 Screw
6 Starter
7 Cable
8 Strap
9 Screw

10 Bracket
11 Unloader valve
12 Pipe clamp
13 Pipe nipple
14 Screw
15 Check valve
16 Pipe nipple
17 Pipe tee
18 Flexible tube

19 Bushing
20 Tee-to-unloader valve tube
21 Through bolt
22 Mounting bracket
23 Bracket
24 Stop
25 Spring
26 Engine
27 Governor control lever

Figure 3-10. Starter, governor control, air lines and fittings, models BMW-452-ENG and BMW-452-ENG-1, removal points

c. Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Position a new gasket and the fuel pump (43) on the cylinder and crankcase assembly (18) and secure with the screws (19) and lockwashers.

(2) Connect the fuel pump-to-carburetor tube (9, fig. 2-7) and fuel strainer-to-fuel pump tube (41) to the fuel pump (43).

(3) Open the fuel shutoff valve (18, fig. 2-6).

3-42. Idling Device

a. Removal (Model BMW-452-ENG-1).

(1) Disconnect the tube (8, fig. 3-7) from the cock (7).

(2) Remove the screws (4) and nuts that secure the idling device (3) to the mounting bracket (6) and remove the idling device.

(3) Remove the bolt and lockwasher that secures the mounting bracket (6) to the intake manifold (5) and remove the mounting bracket.

(4) Remove the screw (1) and nut that secures the control arm (17) to the throttle shaft (10) and remove the control arm.

(5) Remove the cock (7) from the idling device (3).

b. Cleaning and Inspection.

(1) Clean all parts with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, rust on the plunger, damaged threads, and other damage.

(3) Replace all damaged or defective parts.

c. Installation and Adjustment (Model BMW-452-ENG-1).

(1) Install the cock (7) on the idling device (3).

(2) Position the mounting bracket (6) on the intake manifold (5) and secure with the bolt and lockwasher.

(3) Position the idling device (3) on the mounting bracket (6) and secure with the screws (4) and nuts.

(4) Position the control arm (17) on the throttle shaft (10).

(5) Manually place the governor arm (9) in the full speed position. Turn the control arm (17) on the throttle shaft (10) until it just touches the plunger (2) and tighten the screw (1) and nut.

(6) Connect the tube (8) to the cock (7).

Section VII. ENGINE ELECTRICAL SYSTEM

3-43. General

The ignition system provides a properly timed spark to ignite the mixture of fuel and air in the combustion chamber of the engine. The current is produced by an ignition magneto which is composed of an armature, magnetic rotor, and coil. The timing of this current is controlled by the contact points and capacitor located within the magneto. The ignition cable conducts the current from the magneto to the spark plug. The engine stop button, located on the ignition shield, provides a means of stopping the engine.

3-44. Spark Plug

a. Testing Ignition for Spark.

(1) Disconnect the ignition cable (3, fig. 3-2) from the spark plug (5).

(2) Hold the ignition cable one-eighth inch from any metal part of the engine. Rotate the engine with the starter rope .If a spark jumps the gap, the ignition system is functioning properly.

(3) If the spark is weak or if there is no spark, inspect the ignition system for defective components.

b. Removal.

(1) Remove the air shroud cover (para 3-54).

(2) Remove all foreign matter from around the spark plug (1, fig. 2-8) and remove the spark plug from the engine cylinder head (32). Remove the gasket from the spark plug.

c. Cleaning and Inspection.

(1) Clean all applicable parts with a clean cloth dampened with an approved cleaning solvent.

(2) Remove all carbon from the spark plug. Use a conventional spark plug cleaner if available.

(3) Inspect the spark plug for cracks, breaks, and evidence of excessive wear.

(4) Replace a defective plug.

d. Adjustment. Set the spark plug electrode gap to 0.030 inch. Use a feeler gage to measure the gap. If the gap is too large, bend the outer electrode to the proper gap setting.

Caution: **Never attempt to adjust the center electrode. This will crack the insulating porcelain, damaging the spark plug.**

e. Installation.

(1) Install the gasket on the spark plug (1) and install the spark plug in the cylinder head (32). Torque the spark plug to 24 to 26 foot-pounds.

(2) Install the air shroud cover (para 3-54).

f. Model OEG-458-ENG-3. Refer to TM 5-2805-203-14 for spark plug data applicable to model OEG-458-ENG-3.

3-45. Ignition Cable Assembly

a. Removal.

(1) Disconnect the ignition cable terminal sleeve nut (4, fig. 3-2) from the spark plug (5).

(2) Disconnect the terminal sleeve nut (4) from the magneto ignition shield (13).

b. Cleaning and Inspection.

(1) Clean the ignition cable with a clean cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the ignition cable insulation and shielding for cracks, breaks, and other damage.

(3) Inspect the teminals for corrosion and broken or cracked insulators.

(4) Replace all defective parts.

c. Installation.

(1) Connect the terminal sleeve nut (4) to the magneto shield (13).

(2) Connect the terminal sleeve nut to the spark plug (5).

d. Model OEG-458-ENG-3. Refer to TM 5-2805-203-14 for ignition cable data applicable to model OEG-458-ENG-3.

3-46. Magneto Assembly

a. Removal.

(1) Disconnect the ignition cable from the magneto (para 3-45).

(2) Remove the high-tension cable outlet from the ignition shield (13, fig. 3-2).

(3) Remove the magneto drive gear inspection plug (14) from the cylinder and crankcase assembly.

(4) Turn the engine slowly until the magneto timing mark (26, fig. 2-7) located on the magneto drive gear (27), centers in the inspection hole.

(5) Remove the capscrew (22) and lockwasher (23) that secure the magneto mounting flange to the bottom side of the cylinder and crankcase assembly (18).

(6) Remove the nut (40), two lockwashers (23), and bolt (28) that secure the upper side of the magneto mounting flange to the cylinder and crankcase assembly.

(7) Remove the magneto (25) and mounting gasket (24) from the cylinder and crankcase assembly.

(8) Remove the four screws (12) and lockwashers (11) that secure the magneto ignition shield (13) to the magneto. Remove the ignition shield and metal gasket (39) from the magneto.

(9) Remove the screw (27) and lockwasher that secure the vent cover (38) and screw on the side of the magneto. Remove the cover and screen from the magneto. Remove the vent cover and screen mounted on the opposite side in a similar manner.

b. Cleaning, Inspection, and Repair.

(1) Clean the exterior surface of the magneto with a cloth dampened with an approved cleaning solvent and dry thoroughly. Do not submerge the magneto.

(2) Clean the vent covers and screens in an approved cleaning solvent and dry thoroughly. Inspect the screens for clogging and damage.

(3) Inspect the magneto housing and ignition shield for cracks, breaks, and other damage.

(4) Inspect the contact set for dirt, grease, and oil. Remove any dirt or grease from the contact set with a clean, dry, lint-free cloth.

(5) Examine the contact set for pitting or a burned condition. Inspect for excessive wear on the breaker arm cam. Measure the contact set for a correct gap setting of 0.015 inch at full separation. Use a contact file or stone to dress the contact points. Adjust the gap as necessary (see *d* below).

(6) Inspect the wick assembly for a dry condition. Place a few drops of light oil on the wick if necessary.

(7) Replace a defective mounting gasket and magneto.

c. Installation and Timing.

(1) Secure the vent screen and vent cover (38) to the side of the magneto (25) with the lockwasher and screw (37). Install the vent screen and vent cover on the opposite side of the magneto in a similar manner.

(2) Secure the ignition shield (13) and metal gasket (39) to the magneto with the four lockwashers (11) and screws (12).

Note. If the crankshaft was rotated after removal of the magneto, it will be necessary to rest the engine timing gears to properly engage the magneto drive gear. If the crankshaft has not been disturbed, the magneto may be installed as described in (6) through (10) below.

(3) Reset the timing by first removing the spark plug (para 3-31).

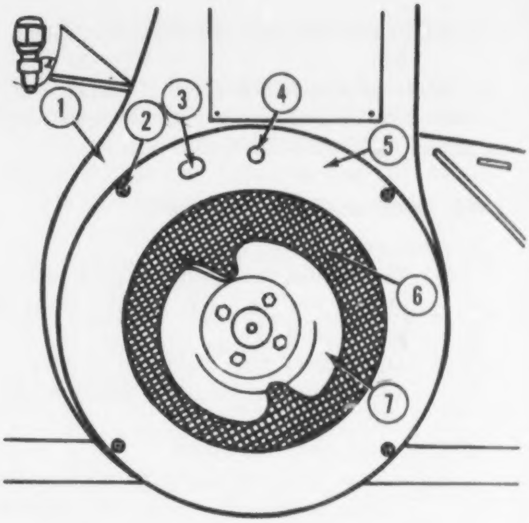
(4) Place a thumb over the spark plug hole and slowly rotate the engine until the piston is on the compression stroke and pressure begins to build up under the thumb.

(5) Look through the air shroud screen (6, fig. 3-11) and position the flywheel timing mark D-C (3, fig. 3-12) at the top. The flywheel air vane timing mark X (2) should then appear centered in the top center inspection hole (4, fig. 3-11) in the air shroud rim (5).

Note. The flywheel timing mark D-C indicates when the piston is at top dead center of the compression stroke. The air vane timing mark may be in the form of white paint, or a stamped X, or both.

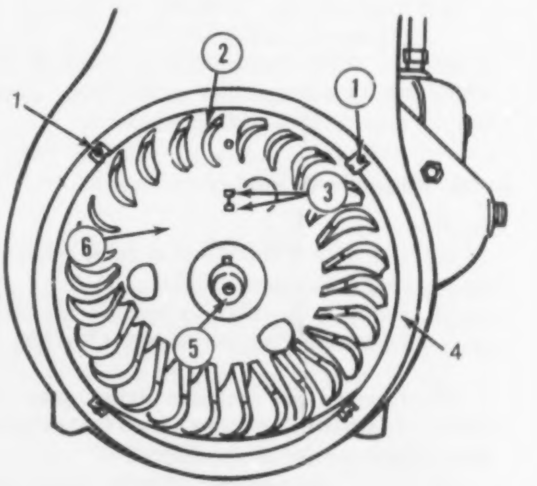
(6) Position the magneto drive gear (27, fig. 2-7) so that when it is installed, the timing mark (X) (26) will appear in the gear housing inspection hole. Position the magneto (25) on the cylinder and crankcase assembly (18) with the timing mark centered in the inspection hole.

(7) Secure the magneto (25) to the top side of the cylinder and crankcase as-



1 Air shroud
2 Screw, machine, 1/4-20 x 1/2 in (4 rqr)
3 20° timing hole
4 Top center inspection hole
5 Rim
6 Screen
7 Starting pulley assembly

Figure 3-11. Rim and screen, removal points.



1 Nut, sheet, spring, No. 14A (4 rqr)
2 Flywheel air vane timing mark (X)
3 Flywheel timing mark (D-C)
4 Air shroud
5 Crankshaft
6 Flywheel

Figure 3-12. Engine flywheel, removal points.

sembly (18) with the bolt (28), two lockwashers (23) and nut (40).

(8) Secure the magneto to the bottom side of the cylinder and crankcase assembly with the capscrew (22) and lockwasher (23).

(9) Turn the engine crankshaft over slowly by hand. If the magneto is properly timed, the impulse coupling will snap when the flywheel air vane timing mark (X) (2, fig. 3-12) appears in the top center inspection hole (4, fig. 3-11).

(10) Install the magneto drive gear inspection plug (14 fig. 3-2) in the crankcase gear housing.

(11) Position the high-tension cable outlet in the ignition shield (13).

(12) Connect the ignition cable to the magneto (para 3-45).

(13) The proper spark advance is 20 percent. For checking timing with a neon light, the running spark advance is indicated through the timing hole (3, fig. 3-11) located 20° before top center on the air shroud rim (5). The air vane timing mark (X) (2, fig. 3-12) should be whitened with chalk or paint for this operation.

d. Contact Set Adjustment.

(1) Remove the magneto ignition shield (see (*a*) above).

(2) Rotate the engine by hand until the magnetic rotor (3, fig. 3-13) opens the contact points to full separation.

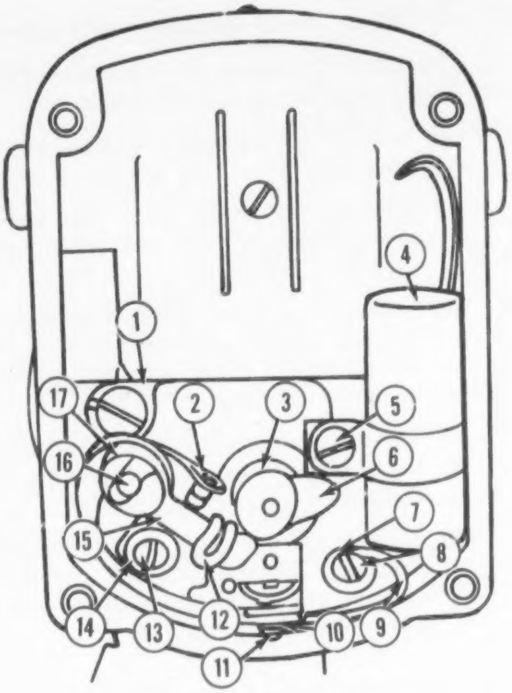
(3) Measure the gap setting of the contact set by inserting a feeler gage between the breaker points. The proper gap is 0.015 inch.

(4) Loosen the contact support locking screws (8 and 13) just enough to allow movement of the contact set support plate (2). Adjust the gap until a light drag is felt as the feeler gage is withdrawn.

(5) Tighten the locking screws (8 and 13) and recheck the gap setting.

(6) Install the magneto ignition shield (see *c* above).

e. Contact Set Replacement (Models BMW-452-ENG and BMW-452-ENG-1).



1 Bearing support plate assembly
2 Contact set support plate
3 Magneto rotor
4 Capacitor
5 Screw, mach. 8-32 x 1/4 in.
6 Camwick and holder assembly
7 Washer, flat, No. 8
8 Screw, mach. 8-32 x 3/8 in.
9 Lead
10 Washer, lock, No. 6 (2 rqr)
11 Screw, mach. 6-32 x 3/8 in.
12 Breaker arm flat wick
13 Screw, mach. 6-32 x 3/8 in.
14 Washer, flat, No. 6
15 Breaker arm and spring
16 Fulcrum pin
17 Retaining ring

Figure 3-13. Magneto contact set, adjustment and removal points.

(1) Remove the magneto ignition shield (see *a* above).

(2) Refer to paragraph 4-19 *a* (3), (4), and (5), for the removal of the contact set.

(3) Refer to paragraph 4-19 *c* (16), (17), and (18), for the installation of the contact set.

(4) Adjust the contact set (see *d* above).

f. Capacitor Replacement (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Remove the magneto ignition shield (see *a* above).

(2) Remove the screw (11, fig. 3-13) and lockwasher (10) and remove the capacitor lead (9).

(3) Remove the screw (5) and lockwasher that secures the capacitor (4) to the bearing support plate (1) and remove the capacitor.

(4) Position the capacitor (4) on the bearing support plate (1) and secure with the screw (5) and lockwasher.

(5) Position the capacitor lead (9) on the coil lead and the breaker arm and spring (15) and secure with the screw (11) and lockwasher (10).

3-47. Generator Drive Belt and Guard

a. Removal.

(1) Remove the screws (11, fig. 3-14) that secure the generator drive belt guard (15) to the brackets (10) and remove the guard (model BMW-452-ENG-1 only).

(2) Remove the screws (9) that secure the brackets (10) to the air shroud (12) and remove the brackets (model BMW-454-ENG-1 only).

(3) Loosen the screw (17) and move the generator (22) toward the engine (3). Remove the generator drive belt (13) from the generator pulley (16) and the starting pulley (14).

b. Cleaning and Inspection.

(1) Clean all metal parts in approved cleaning solvent and dry thoroughly. Clean the drive belt with a clean, dry cloth. Use no solvent to clean dirt or grease from the belt. If necessary, scrub the belt with soap and water and allow it to dry thoroughly.

(2) Inspect all metal parts for cracks, bends, damaged threads, or other damage. Inspect the belt for cracks, fraying, and excessive wear.

(3) Replace any defective parts.

c. Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Install the generator drive belt (13) on the starting pulley (14) and the generator pulley (16). Move the generator (22) away from the engine (3) until the proper tension is reached. When the belt is properly adjusted, a deflection of three-quarters inch will result from pressing down at a point midway between the pulleys. When the proper adjustment is reached, tighten the screw (17).

(2) Secure the brackets (10) to the air shroud (12) with the screws (9) (model BMW-452-ENG-1 only).

(3) Secure the generator drive belt guard (15) to the brackets (10) with the screws (11) (model BMW-452-ENG-1 only).

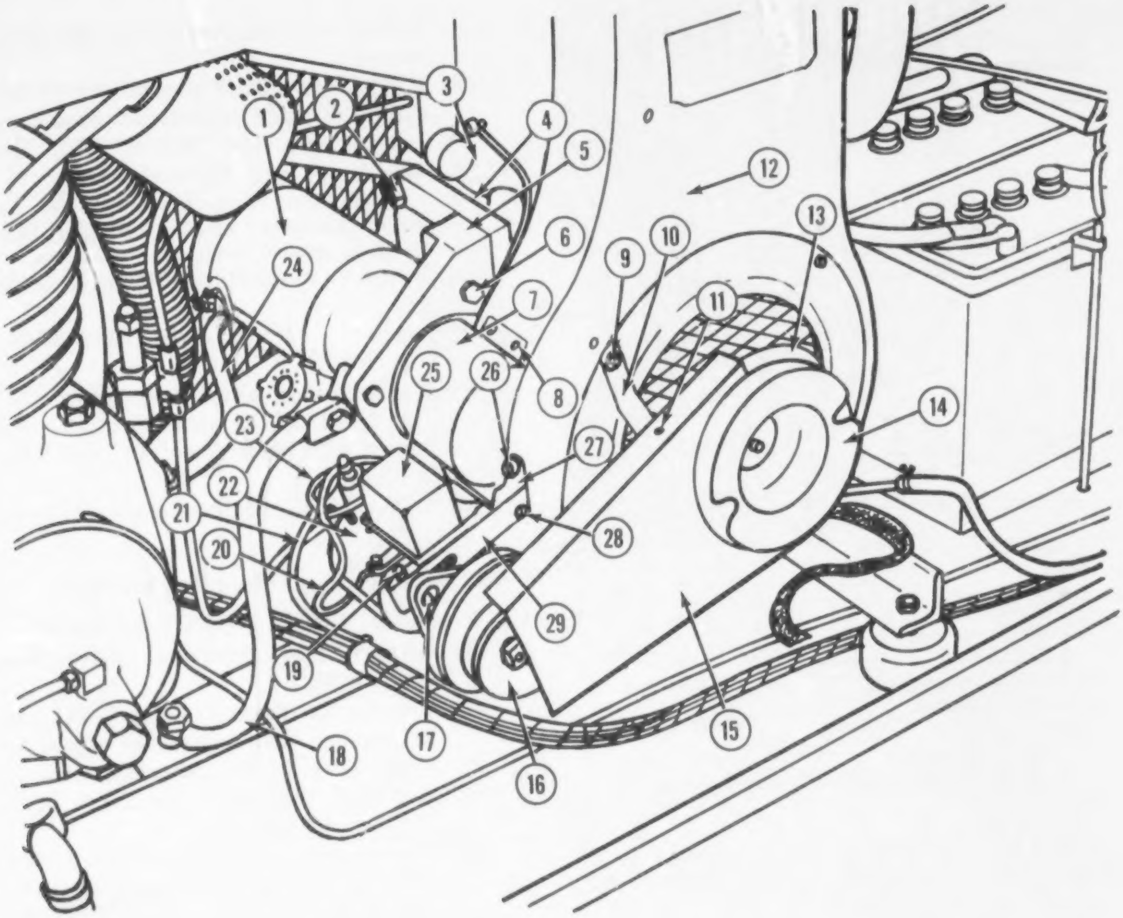
3-48. Voltage Regulator

a. On-Equipment Testing (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Defects in the generator or the regulator as indicated on the ammeter by a continuous high-charging rate when the battery is fully charged, or by a low- or no-charging rate when the battery is low.

(2) When a high-charging rate is indicated, run the engine at operating speed and disconnect the lead from the terminal marked "F". If the output remains high, the trouble is in the generator. Replace a defective generator (para 3-49). If the output drops off, the trouble is in the regulator. Replace a defective regulator (*b* through *f* below).

(3) When a low- or no-charging rate is indicated, inspect for loose connections, frayed or damaged wires, or a defective battery. If none of these conditions exists, operate the engine at medium speed and momentarily ground the terminal marked "F". No increase



1 Starter
2 Screw
3 Engine
4 Spacer
5 Starter mounting bracket
6 Nut
7 Starter guard
8 Screw
9 Screw
10 Bracket
11 Screw
12 Air shroud
13 Generator drive belt
14 Starting pulley
15 Generator drive belt guard
16 Generator pulley
17 Screw
18 Ground strap
19 Screw
20 Electrical lead
21 Electrical lead
22 Generator
23 Ground
24 Cable
25 Voltage regulator
26 Screw
27 Mounting bracket
28 Screw
29 Adjustment strap

Figure 3-14. Generator drive belt guard, generator, starter, and regulator, model BMW-452-NEG-1, removal points.

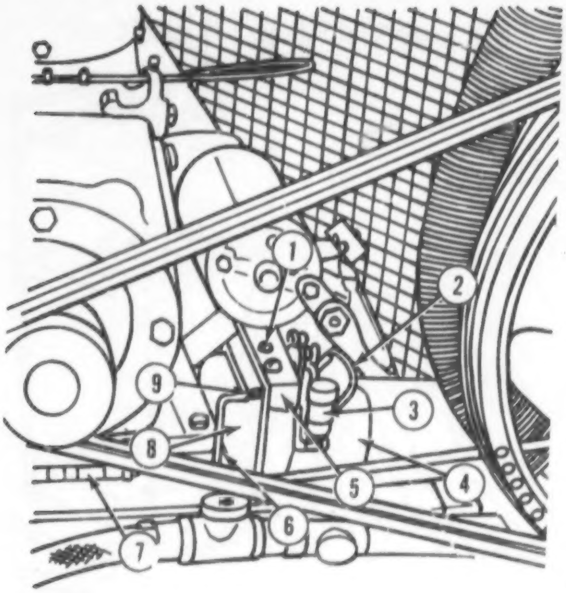
in the output indicates a defect in the regulator. Replace a defective regulator (*b* through *f* below).

b. Removal (Model BMW-452-ENG).

(1) Tag and disconnect applicable electrical leads (2, fig. 3-15).

(2) Remove the screws (9) and lockwashers that secure the shock mount (5) and capacitors (3) to the generator and regulator mounting bracket (8) and remove the capacitors, shock mount, and voltage regulator (4).

(3) Remove the screws (1) and lockwashers that secure the voltage regulator (4) to the shock mount (5) and remove the voltage regulator from the shock mount.



1 Screw
2 Electrical lead
3 Capacitor
4 Voltage regulator
5 Shock mount
6 Screw
7 Engine base
8 Generator and regulator mounting bracket
9 Screw

Figure 3-15. Voltage regulator and generator and regulator mounting bracket, model BMW-452-ENG, removal points.

c. Removal (Model BMW-452-ENG-1).

(1) Tag and disconnect applicable electrical leads (20, fig. 3-14).

(2) Remove the screws (19) and lockwashers that secure the voltage regulator (25) to the generator (22) and remove the voltage regulator.

d. Cleaning and Inspection.

(1) Clean the exterior of the voltage regulator with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect for loose or damaged terminals, bent or cracked cover, and other damage.

(3) Replace a damaged voltage regulator.

e. Installation (Model BMW-452-ENG).

(1) Position the voltage regulator (4, fig. 3-15) on the shock mount (5) and secure with the screws (1) and lockwashers.

(2) Position the shock mount (5) on the generator and regulator mounting bracket (8) and secure with the screws (9) and lockwashers.

Note. **Refer to paragraph 3-31 for the proper placement of the tooth-type lockwashers, ground lead, and capacitors.**

(3) Connect applicable electrical leads (2).

f. Installation. (Model BMW-452-ENG-1).

(1) Position the voltage regulator (25, fig. 3-14) on the generator (22) and secure with the screws (19) and lockwashers.

(2) Connect applicable electrical leads (20).

3-49. Generator and Mounting Bracket

a. Removal (Model BMW-452-ENG).

(1) Remove the generator drive belt (para 3-47).

(2) Remove the screw (14, fig. 3-16) and lockwasher that secure the adjusting strap (10) to the generator (8).

(3) Tag and disconnect electrical leads (13) as necessary.

(4) Loosen screws (9) on mounting straps (11) and remove the generator (3) and mounting straps (11) from the mounting bracket (15).

(5) Remove the nut (7) and lockwasher from both ends of the stud and remove the mounting bracket and stud.

(6) Remove nut, screw (5) and lockwasher that secure the adjusting strap (10) to the generator and regulator mounting bracket and remove the adjusting strap.

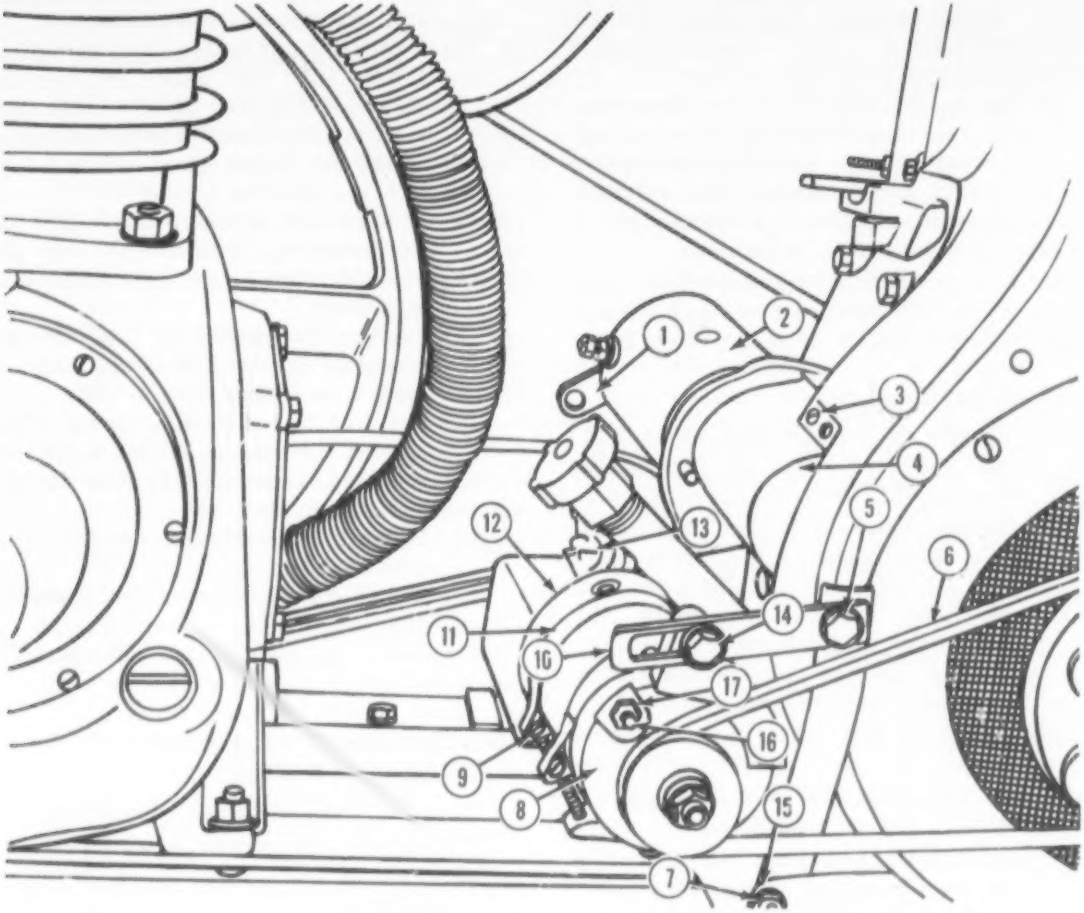
b. Removal (Model BMW-452-ENG-1).

(1) Remove the generator drive belt (para 3-47).

(2) Remove the generator regulator (para 3-48).

(3) Tag and disconnect the electrical lead (21, fig. 3-14) and the ground (23)

(4) Remove the nut, lockwasher, screw (17) and flat washer that secures the generator to the adjusting strap (29).



1 Link
2 Starter
3 Screw
4 Guard
5 Screw
6 Belt
7 Nut
8 Generator
9 Screw
10 Strap
11 Strap
12 End bell
13 Lead
14 Screw
15 Bracket
16 Bolt
17 Nut

Figure 3-16. Generator and starter, model BMW-452-ENG, removal points.

(5) Remove the nuts, lockwasher, and screws that secure the generator (22) to the mounting bracket and remove the generator (22).

(6) Remove the nut, lockwasher, and screw (28) that secures the adjusting strap (29) to the mounting bracket (27) and remove the adjusting strap.

(7) Remove the starter guard (para 3-51), if it is necessary to remove the adjusting strap mounting bracket (27).

(8) Remove the screws (26), lockwashers, and nuts that secure the adjusting strap mounting bracket (27) to the air shroud (12) and remove the bracket.

(9) Remove the screws and lockwashers that secure the generator mounting bracket to engine base and remove the bracket.

c. Cleaning and Inspection.

(1) Clean the exterior of the generator with a cloth dampened with an approved solvent and dry thoroughly.

(2) Inspect the generator for external damage. Replace the generator if it is damaged or inoperative.

(3) If it is suspected that the brushes are excessively worn, inspect and replace the brushes, if necessary (see *d* below).

d. Brush Replacement.

(1) Remove the through bolts (16, fig. 3-16) and nuts (17) and remove the end bell (12) from the generator (8).

(2) Remove the brushes from the brush holders and inspect for excessive wear. If the brushes are less than one-half inch long, remove the screws and lockwasher and remove the brushes. Position the new brushes and secure with the screws and lockwashers.

(3) Install the end bell (12) on the generator (8) and secure with the through bolts (16) and nuts (17).

e. Installation (Model 452-ENG).

(1) Position the mounting bracket (15) on the generator and regulator mounting bracket and secure with the stud, nuts (7) and lockwashers.

(2) Install the mounting straps (11) on the generator (8). Position the generator and mounting straps on the mounting bracket (15) and secure by tightening the screws (9).

(3) Connect electrical leads (13).

(4) Position the adjusting strap (10) on the generator (8) and the generator and regulator mounting bracket and secure by installing screws (5 and 14) and lockwashers.

(5) Install and adjust generator drive belt (para 3-47). When adjustment is completed, tighten screw (5).

f. Installation. (Model BMW-452-ENG-1).

(1) Position the generator mounting bracket on the engine base and secure with the screws and lockwashers.

(2) Position the adjusting strap mounting bracket (27, fig. 3-14) or the air shroud (12) and secure with the screws (26), lockwashers, and nuts.

(3) Install the starter guard (para 3-51) if it was removed.

(4) Position the adjusting strap (29) on the mounting bracket (27) and secure with the screw (28), lockwasher, and nut.

(5) Position the generator (22) on the mounting bracket and secure with the screws, lockwashers, and nuts.

(6) Position the adjusting strap (29) against the generator (22) and loosely install the screw (17), flat washer, lockwasher, and nut.

(7) Connect the electrical lead (21) and ground (23).

(8) Install generator regulator (para 3-48).

(9) Install generator drive belt (para 3-47).

3-50. Generator and Regulator Mounting Bracket

a. Removal (Model BMW-452-ENG).

(1) Remove the generator (para 3-49).

(2) Remove the voltage regulator (para 3-48).

(3) Remove the screws (6, fig. 3-15) and lockwashers that secure the generator and regulator mounting bracket (8) to the engine base (7) and remove the bracket.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks and damaged threads.

(3) Replace all damaged parts.

c. Installation (Model BMW-452-ENG).

(1) Position the generator and regulator mounting bracket (8) on the engine base (7) and secure with the screws (6) and lockwashers.

(2) Install the voltage regulator (para 3-48).

(3) Install the generator (para 3-49).

3-51. Starter and Mounting Bracket

a. Removal (Model BMW-452-ENG).

(1) Tag and disconnect the ground strap (8, fig. 3-10) and the cable (7) from the starter (6).

(2) Remove the screws (3, fig. 3-16) that secure the starter guard (4) to the air shroud and remove the starter guard.

(3) Remove the through bolts (21, fig. 3-10) that secure the starter (6) to the mounting bracket (22) and remove the starter.

(4) Remove the screw (5), lockwasher, countersunk screw, and external-tooth cupped washer that secure the mounting bracket (22) to the engine (26) and remove the bracket.

b. Removal (Model BMW-452-ENG-1).

(1) Remove the drive belt guard (para 3-58).

(2) Remove the generator drive belt from the generator (para 3-47).

(3) Remove the adjusting strap from the generator (para 3-49) and lay generator on the mounting frame.

(4) Tag and disconnect the cable (24, fig. 3-14) and ground strap (18).

(5) Remove the screws (8) that secure the starter guard (7) to the air shroud (12) and remove the guard.

(6) Remove the screws, lockwashers, and nuts (6) that secure the starter (1) to the mounting bracket (5) and remove the starter.

(7) Remove the engine oil filler plug and fitting (para 3-65).

(8) Remove the screws (2), lockwashers, and spacers (4) that secure the mounting bracket (5) to the engine (3) and remove the bracket.

c. Cleaning and Inspection.

(1) Clean all parts with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the starter for external damage and corrosion. Inspect all other parts for cracks, damage threads, and other damage.

(3) Replace all damaged parts.

d. Installation (Model BMW-452-ENG).

(1) Position the mounting bracket (22, fig. 3-10) on the engine (26) and secure with the screw (5), lockwasher, countersunk screw, and external-tooth cupped washer.

(2) Position the starter (6) on the mounting bracket (22) and secure with the through bolts (21).

(3) Position the starter guard (4, fig. 3-16) on the air shroud and secure with the screws (3).

(4) Connect the ground strap (8, fig. 3-10) and cable (7) to the starter (6).

e. Installation (Model BMW-452-ENG-1).

(1) Position the spacers (4, fig. 3-14) and mounting bracket (5) on the engine (3) and secure with the screws (2) and lockwashers.

(2) Install the oil filler plug and fitting (para 3-65).

(3) Position the starter (1) on the mounting bracket (5) and secure with the screws, lockwashers, and nuts (6).

(4) Connect the cable (24) and ground strap (18).

(5) Install the adjusting strap to the generator (para 3-49).

(6) Install and adjust the generator drive belt (para 3-47).

(7) Install the drive belt guard (para 3-58).

3-52. Batteries and Cables

a. Removal.

(1) Disconnect cables (16 and 17, fig. 3-8) from the battery (15).

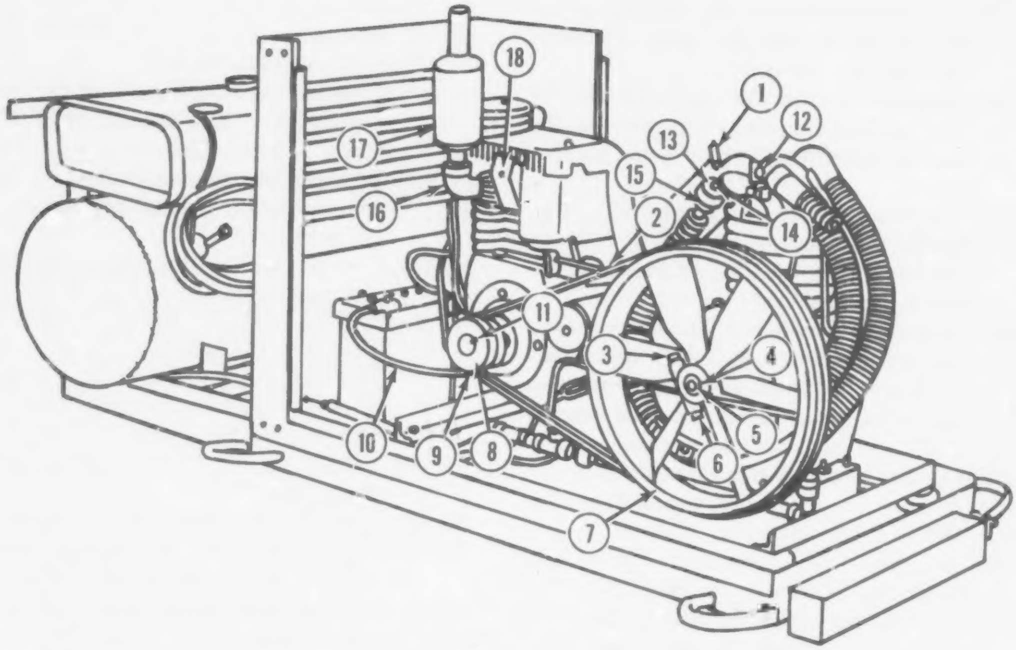
(2) Remove nut (13) and remove the frame (14).

(3) Remove the battery (15).

(4) Remove screw (9, fig. 3-17) and remove ground cable (10). Remove the other cable in a similar manner.

b. Cleaning, Inspection, and Testing.

(1) Clean the cable terminals and battery terminals with a wire brush. Wash the battery and terminals with a solution



1 Safety Valve
2 Belt set
3 Bolt
4 Key
5 Compressor crankshaft
6 Nut
7 Compressor flywheel
8 Drive pulley
9 Screw
10 Ground cable
11 Key
12 High-pressure intake manifold
13 Stud
14 Nut
15 Nut, coupling
16 Elbow
17 Muffler
18 High temperature switch

Figure 3-17. Belt set, removal points.

of water and baking soda, if any of the electrolyte has been spilled, or if the terminals are corroded, and the battery is dirty. Rinse off with water and dry thoroughly.

(2) Inspect the battery for cracked or broken case. Inspect the battery cables for worn or damaged insulation and for loose or defective terminals. Replace a defective battery or cables.

(3) Inspect the level of the electrolyte. If necessary, fill each cell with distilled water to a level of three-eights inch above the plates.

(4) Test the specific gravity of the electrolyte as prescribed in TM 9-6140-200-15.

c. Installation.

(1) Install the ground cable (10) and secure with the screw (9).

(2) Place the battery (15, fig. 3-8) in its proper position and secure with the frame (14) and nuts (13).

(3) Connect the cables (16 and 17) to the battery (15).

Section VIII. ENGINE COOLING AND EXHAUST SYSTEMS

3-53. General

The engine is forced-air-cooled from a blower integrated with the flywheel. An air shroud incloses the top and three sides of the engine cylinder with an intake opening at the blower. Air from the blower is forced around and over the top of the engine to dissipate the heat. The exhaust system, which is composed of a muffler and fittings, provides a means of releasing the exhaust gases to the atmosphere. Refer to TM 5-2805-203-14 for data applicable to Model OEG-458-ENG-3.

3-54. Air Shroud, Cover, Rim, and Screen

a. Removal.

(1) *Air shroud cover.*

(*a*) Remove the ignition cable (para 3-45).

(*b*) Remove the nut (3, fig. 2-8) and lockwasher (5) that secure the air shroud cover (2) to the cylinder head stud (4).

(*c*) Loosen the screw (9, fig. 3-2) that secures the air shroud cover (7) and shroud (22) to the side of the cylinder head (6) and remove the cover and stud spacer from the engine cylinder head.

(2) *Rim and screen.*

(*a*) Remove the starting pulley (para 3-64).

(*b*) Remove the four screws (2, fig. 3-11) that secure the rim (5) and screen (6) to the air shroud (1). Remove the rim and screen.

(3) *Air shroud.*

(*a*) Remove the engine flywheel (para 3-55).

(*b*) Remove the intake manifold (para 3-67).

(*c*) Remove the air shroud cover (see (1) above).

(*d*) Remove the screws (3, fig. 3-16) that secure the starter guard to the air shroud.

(*e*) Remove the screws (26, fig. 3-14), lockwashers, and nuts that secure the backet (27) to the air shroud (12).

(*f*) Remove the two capscrews (25, fig. 3-18) that secure the inside rear of the air shroud (22) to the front of the cylinder and crankcase assembly (17).

(*g*) Remove the four screws (35, fig. 2-8) and lockwashers (34) that secure the air shroud (36) to the rear and sides of the cylinder and crankcase assembly (19) and remove the air shroud.

(*h*) Remove the four sheet spring nuts (1, fig. 3-12) from the front of the air shroud (4).

(*i*) Remove the screw (21, fig. 3-2), lockwasher, and nut that secure the air cleaner bracket clip (20) to the air shroud (22). Remove the bracket clip.

b. Cleaning, Inspection, and Repair.

(1) Clean the air shroud, cover, rim and screen with an approved cleaning solvent and dry thoroughly.

(2) Inspect all applicable parts for dents, cracks, breaks, and other damage.

(3) Inspect all threaded parts for damaged threads.

(4) Repair or replace all defective parts as necessary.

c. Installation.

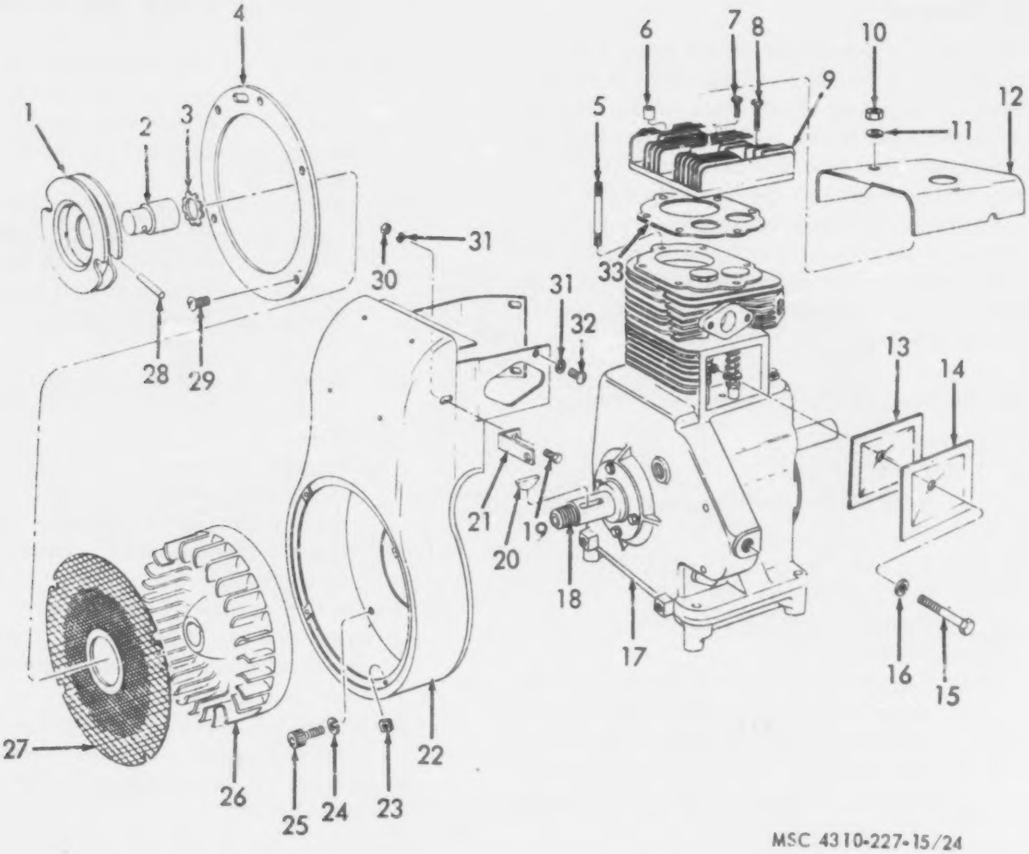
(1) *Air shroud.*

(*a*) Secure the air cleaner bracket clip (21, fig. 3-18) to the air shroud (22) with the screw (19), lockwasher (31), and nut (30).

(*b*) Position the four sheet spring nuts (23) on the air shroud.

(*c*) Position the air shroud on the cylinder and crankcase assembly (17) and install the four screws (32) and lockwashers (31) that secure the air shroud to the rear and sides of the cylinder and crankcase assembly.

(*d*) Install the two capscrews (25) and lockwashers (24) that secure the inside rear of the air shroud to the



MSC 4310-227-15/24

1 Starting pulley
2 Nut and shaft extention, 7-32 × 1 1/2 in.
3 Washer, lock, ET, 7/8 in.
4 Air shroud rim
5 Stud, plain, 3/8-16 one end, 3/8-24 other end, 3 1/4 in lg
6 Stud spacer
7 Screw, cap, hex-hd 3/8-16 × 1 1/4 in. (2 rqr)
8 Screw, cap, hex-hd 3/8 × 1 1/2 in. (3 rqr)
9 Cylinder head
10 Nut, hex, plain, 3/8-24
11 Washer, flat, 3/8 in. (6 rqr)
12 Air shroud cover
13 Valve cover gasket
14 Valve chamber access cover
15 Bolt, mach. hex-hd, 5/16-18 × 2 in.
16 Washer, flat, copper, 5/16 in.
17 Cylinder and crankcase assembly
18 Crankshaft
19 Screw, machine, 1/4-20 × 1/2 in.
20 Key, woodruff, No. 22
21 Bracket clip
22 Air shroud
23 Nut, sheet, spring No. 14 (4 rqr)
24 Washer, lock, 5/16 in. (2 rqr)
25 Screw, cap, socket-hd, 5/16-18 × 1 1/2 in. (2 rqr)
26 Engine flywheel
27 Screen
28 Grooved taper pin
29 Screw, mach. 1/4-20 × 1/2 in. (4 rqr)
30 Nut, plain, hex, 1/4-20
31 Washer, lock, 1/4 in. (5 rqr)
32 Screw, mach. 1/4-20 × 3/8 in. (4 rqr)
33 Gasket

Figure 3-18. Air shroud, flywheel starting pulley assembly, and cylinder head, exploded view.

front of the cylinder and crankcase assembly.

(*e*) Position the bracket (27, fig. 3-14) on the air shroud (12) and secure with the screws (26), lockwashers, and nuts.

(*f*) Position the starter guard on the air shroud and secure with the screws (3, fig. 3-16).

(*g*) Install the air shroud cover (see (3) below).

(*h*) Install the intake manifold (para 3-67).

(*i*) Install the engine flywheel (para 3-55).

(2) *Rim and screen.*

(*a*) Secure the air shroud rim (4) and screen (27) to the air shroud with the four screws (29).

(*b*) Install the starting pulley (para 3-64).

(3) *Air shroud cover.*

(*a*) Position the stud spacer (6) on the mounting stud (5) and secure the cover (12) to the cylinder head (9) by tightening the screw (32).

(*b*) Install the nut (10) and flat washer (11) that secure the cover to the mounting stud (5).

(*c*) Install the ignition cable (para 3-45).

3-55. Engine Flywheel

a. Removal.

(1) Remove the rim and screen (para 3-54).

(2) Remove the flywheel (6, fig. 3-12) from the engine crankshaft (5) by tapping lightly on the front end of the crankshaft with a soft metal hammer and, at the same time, exerting an outward pull on the flywheel air vanes.

(3) Remove the woodruff key (20, fig. 3-18) from the crankshaft.

b. Cleaning and Inspection.

(1) Clean all applicable parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect the flywheel for cracks, chips, nicks, and other damage. Inspect for defective air vanes.

(3) Make sure the timing marks are legible.

(4) Replace a damaged flywheel.

c. Installation.

(1) Position the woodruff key (20) on the engine crankshaft (18). Aline the flywheel (26) with the woodruff key and install the flywheel on the crankshaft.

(2) Install the rim and screen (para 3-54).

3-56. Muffler and Fittings

a. Removal (Models OEG-458-ENG-1 and OEG-458-ENG-2).

(1) Remove the muffler (30, fig. 2-8) from the pipe nipple (29).

(2) Remove the nipple from the cylinder and crankcase assembly (19).

b. Removal (Model BMW-452-ENG and BMW-452-ENG-1).

(1) Loosen the screw that secures the muffler rain cap (2, fig. 1-6) to the muffler and remove the rain cap.

(2) Remove the shield (10, fig. 1-6) from the muffler (17, fig. 3-17).

(3) Remove the muffler (17) from the elbow (16) by turning the muffler counterclockwise.

(4) Loosen the locknut on the elbow (16) and remove the elbow from the cylinder and crankcase assembly. Remove the locknut from the elbow.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the muffler for holes, cracks, and excessive rust.

(3) Inspect the nipple, dust cap, shield, elbow, and locknut for damaged threads, cracks, excessive rust, or other damage.

(4) Replace any defective parts.

d. Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Install locknut on elbow (16). Install the elbow in the cylinder and crankcase assembly.

(2) Install the muffler (17) on the elbow (16).

(3) Install the shield (10, fig. 1-6) on the muffler.

(4) Install the rain cap (2) on the muffler and secure by tightening the screw.

(5) Tighten the locknut on the elbow (16, fig. 3-17).

e. Installation (Model OEG-458-ENG-1 and OEG-458-ENG-2).

(1) Install the nipple (29, fig. 2-8) in the cylinder and crankcase assembly (19).

(2) Install the muffler (30) on the nipple (29).

Section IX. BELT GUARD, AND BELT SET

3-57. General

This section applies to maintenance of the belt guard, and belt set. The belt guard is a safety device which reduces the possibility of injury to operating personnel who might accidently come in contact with the belt set. The unit is equipped with three belts which couple the engine drive pulley to the compressor flywheel.

3-58. Belt Guard

a. Removal and Disassembly (Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1).

(1) Remove the capscrews (7, fig. 3-19), lockwashers, and nuts that secure the lower belt guard straps (6) to the mounting base.

(2) Remove the capscrew (1) that secures the top belt guard strap (2) to the manifold stud and remove the belt guard (4) from the unit.

(3) Remove the nuts (3), flat washers, and lockwashers that secure the belt guard strap (2) to the belt guard and remove the strap.

b. Removal and Disassembly (Model OEG-458-ENG-3). Refer to figure 3-20, and remove and disassemble belt guard.

c. Cleaning, Inspection, and Repair.

(1) Clean all applicable parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect the belt guard and strap for dents, cranks, breaks, and other damage.

(3) Repair or replace all damaged or defective parts.

d. Reassembly and Installation (Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1).

(1) Secure the top belt guard strap (2) to the belt guard (4) with the flat washers, lockwashers, and nuts (3).

(2) Place the belt guard in position on the unit and secure the top belt guard strap (2) to the manifold stud with nut (1).

(3) Secure the lower belt guard strap (6) to the mounting base (8) with the capscrews (7), lockwashers, and nuts.

e. Reassembly and Installation (Model OEG-458-ENG-3). Refer to figure 3-20, and assemble and install belt guard.

3-59. Belt Set

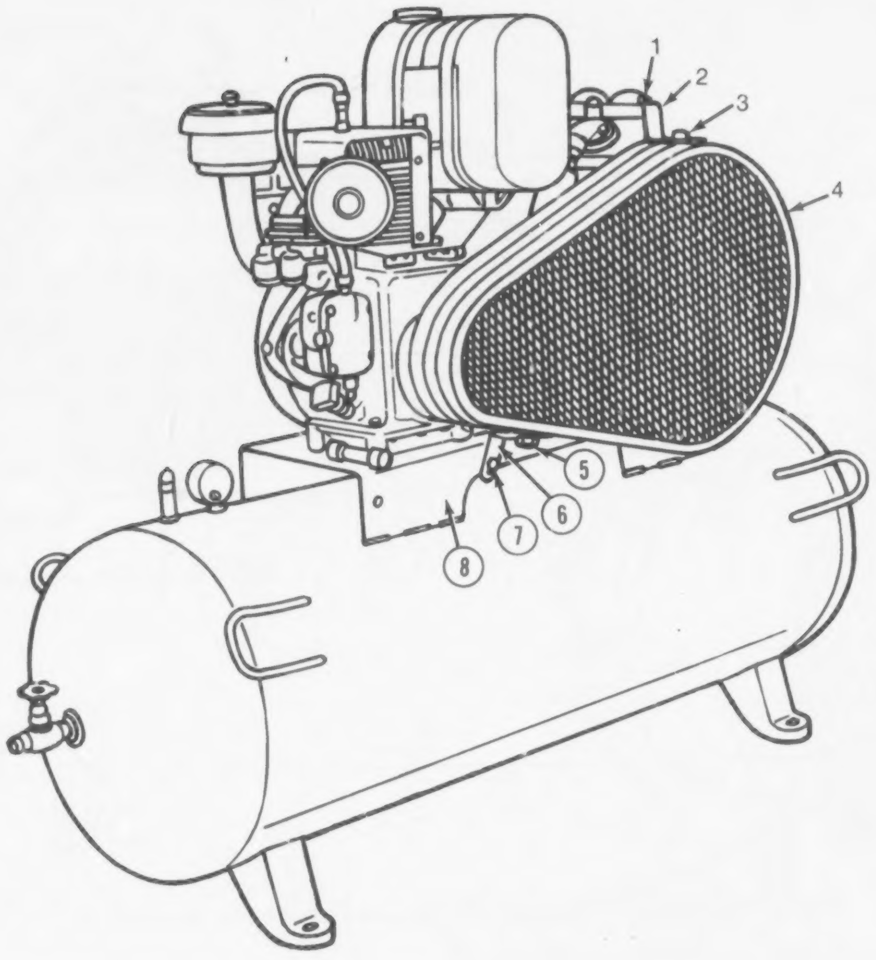
a. Removal (Models OEG-458-ENG-1, OEG-458-ENG-2, BMW-452-ENG, and BMW-452-ENG-1).

(1) Remove the belt guard (para 3-58) Models OEG-458-ENG-1, OEG-458-ENG-2, and BMW-452-ENG-1.

(2) On model OEG-458-ENG-1 and OEG-458-ENG-2, loosen the four nuts (1, fig. 3-21) and slide the engine toward the compressor to remove the tension from the belt set (2, fig. 3-17).

(3) On models BMW-452-ENG and BMW-452-ENG-1, loosen the four screws (22, fig. 3-22) and slide the compressor toward the engine to remove the tension from the belt set (2, fig. 3-17).

(4) Remove the belt set from the engine drive pulley (8) and compressor flywheel assembly (7).



1 Screw, cap
2 Strap
3 Screw, cap
4 Guard
5 Screw, cap
6 Strap
7 Screw, cap
8 Mounting base

Figure 3-19. V-belt guard, removal points.

b. Removal (Model OEG–458–ENG–3). Refer to figure 3–23, and remove V-belts.

c. Cleaning and Inspection.

(1) Clean the belt set with a clean, dry cloth. Use no solvents to clean the belt set. If dirt or grease persists, scrub the belt set with soap and water and allow them to dry thoroughly.

(2) Inspect the belt set for cracks, fraying, and excessive wear.

(3) Replace the belt set if any one of the three belts is defective.

d. Installation and Adjustment.

(1) Install the belt set (2) on the compressor flywheel assembly (7) and engine drive pulley (8).

(2) On models OEG–458–ENG–1 and OEG–458–ENG–2, slide the engine away from the compressor, and on

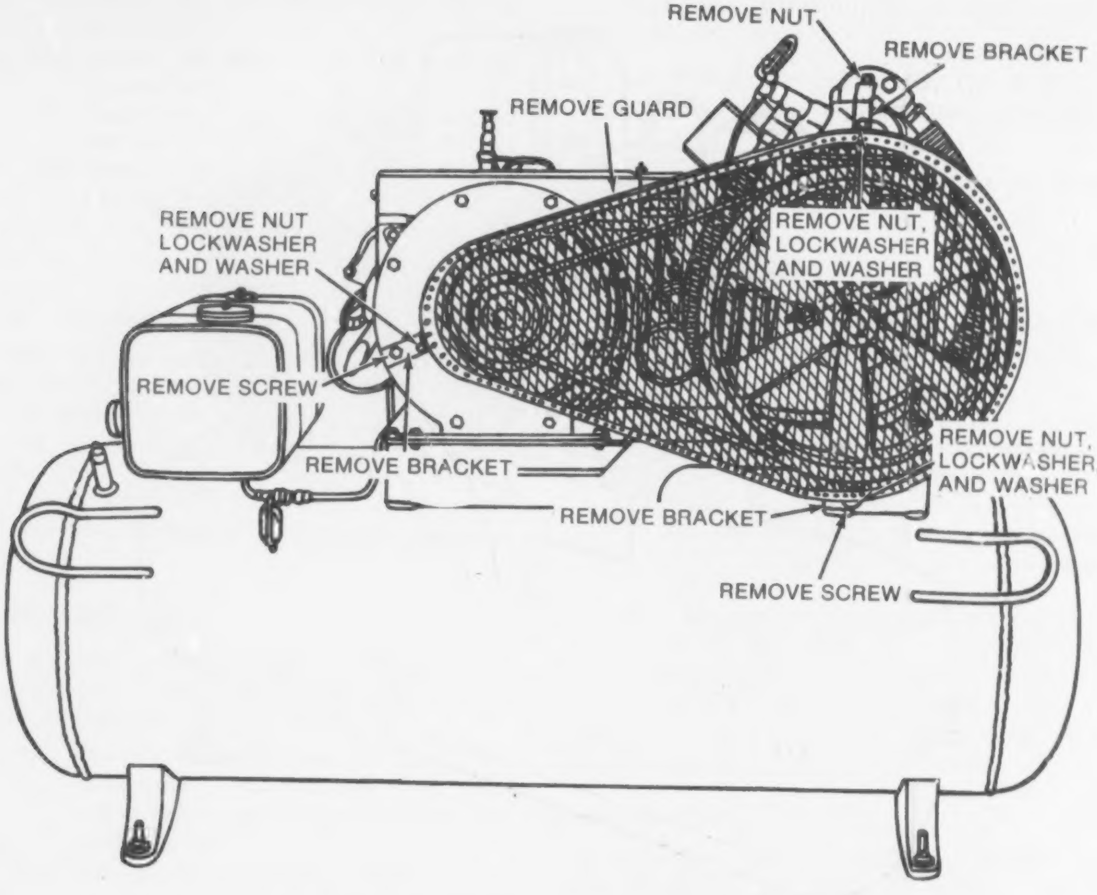
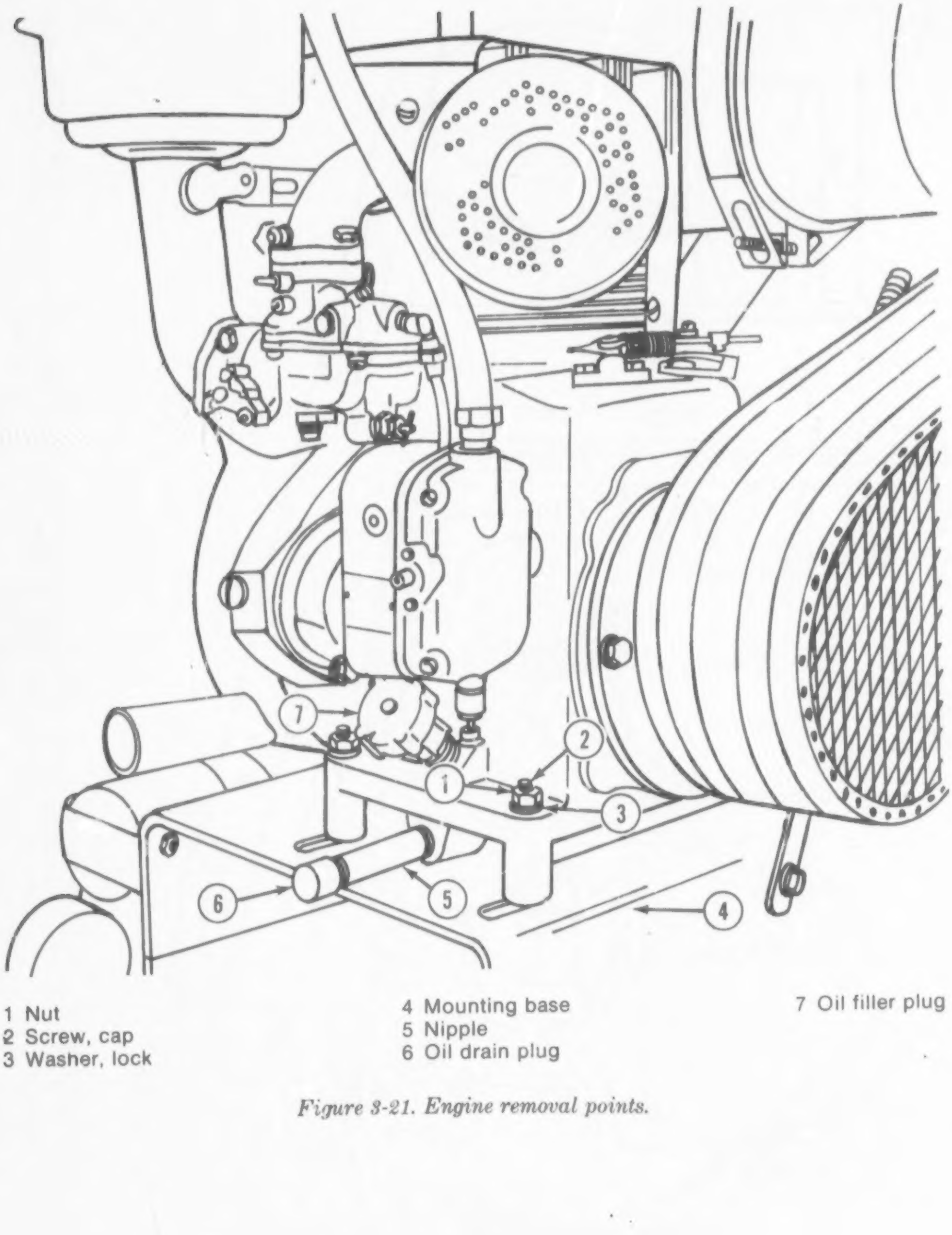

REMOVE NUT
REMOVE BRACKET
REMOVE GUARD
REMOVE NUT LOCKWASHER AND WASHER
REMOVE NUT, LOCKWASHER AND WASHER
REMOVE SCREW
REMOVE BRACKET
REMOVE NUT, LOCKWASHER, AND WASHER
REMOVE BRACKET
REMOVE SCREW

Figure 3-20. Belt guard, removal and installation (Model OEG-458-ENG-3)

models BMW–452–ENG and BMW–452–ENG–1, slide the compressor away from the engine until there is tension on the belt set. When the belt set is properly adjusted, a deflection of three-quarters inch will result from pressing down at a point midway between the engine drive pulley and compressor flywheel assembly. When the proper adjustment is reached, tighten the four nuts (1, fig. 3–21) on models OEG–458–ENG–1, OEG–458–ENG–2, and OEG–458–ENG–3, or the four screws (22, fig. 3–22) on models BMW–452–ENG and BMW–452–ENG–1.

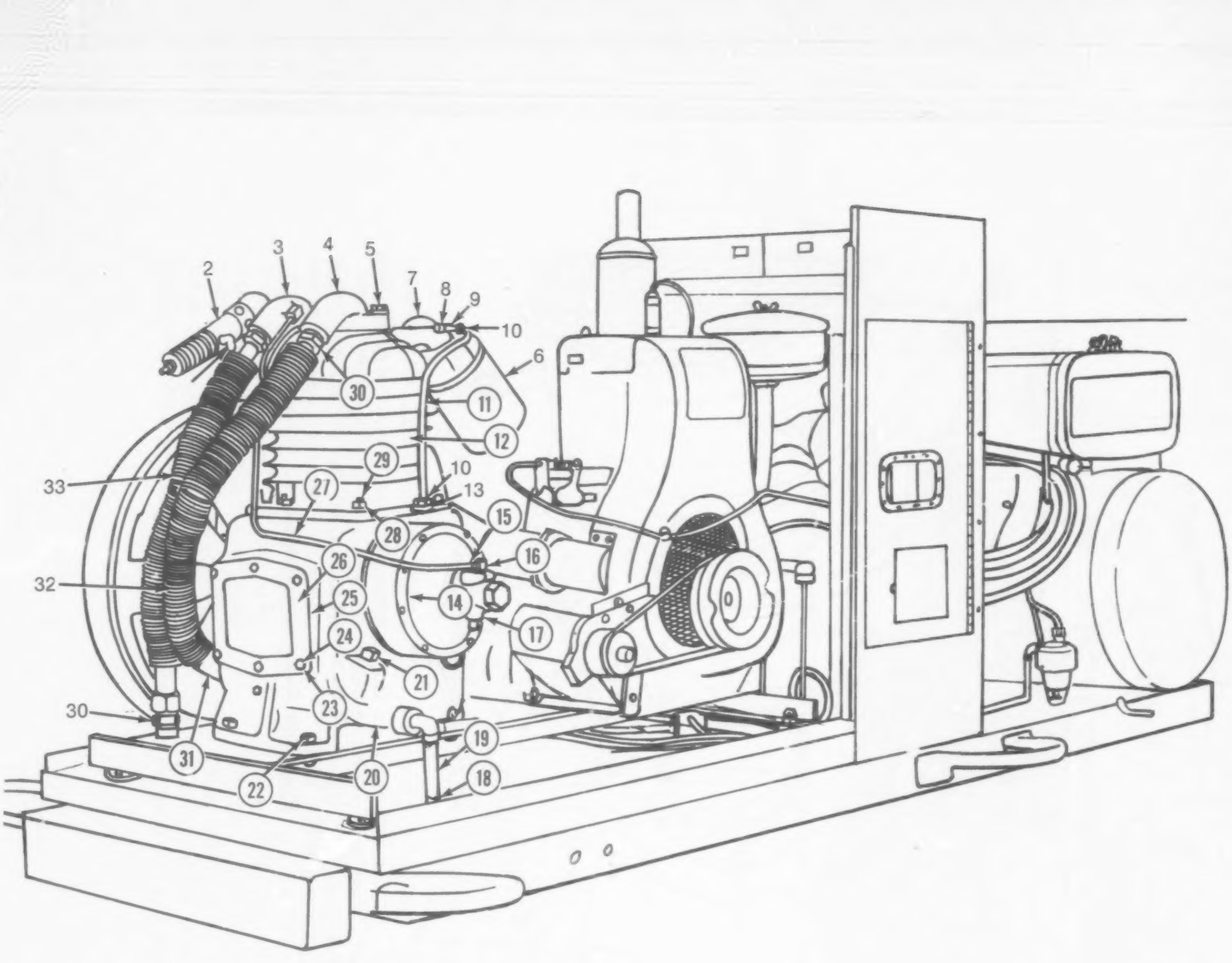
(3) Install the belt guard (para 3–58), models OEG–458–ENG–1, OEG–458–ENG–2, OEG–458–ENG–3, and BMW–452–ENG–1.

e. Installation (Model OEG–458–ENG–3). Refer to figure 3–23, and install v–belt.



1 Nut
2 Screw, cap
3 Washer, lock
4 Mounting base
5 Nipple
6 Oil drain plug
7 Oil filler plug

Figure 3-21. Engine removal points.



1 Valve tube
2 Unloader valve
3 High-pressure exhaust manifold
4 Low-pressure exhaust manifold
5 Nut
6 Air cleaner
7 Low-pressure intake manifold
8 Nut
9 Elbow
10 Nut
11 Breather tube
12 Cylinder
13 Adapter
14 Housing cover
15 Nut
16 Elbow
17 Air muffler
18 Cap, pipe
19 Nipple, pipe
20 Crankcase
21 Oil filler plug

Figure 3-22. Compressor components, models BMW-452-ENG and BMW-452-ENG-1, removal points.

22 Screw, cap
23 Gasket
24 Screw, cap
25 Gasket
26 Access cover plate
27 Unloader tubing
28 Nut
29 Stud
30 Coupling nut
31 Elbow
32 Intercooler tube
33 Aftercooler tube

Callouts For Figure 3-22—Continued.

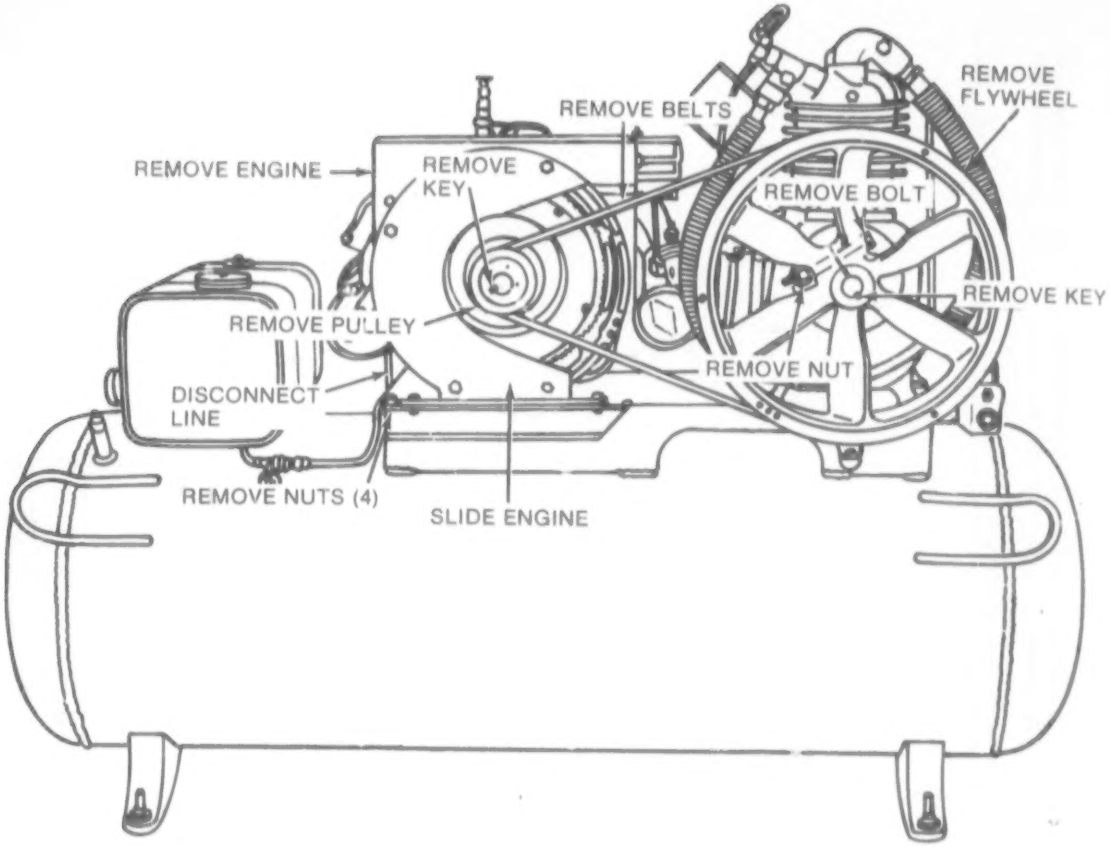


Figure 3-23. V-belts, crankshaft flywheel, drive pulley, and engine, removal and installation (Model OEG-458-ENG-3).

Section X. ENGINE AND COMPRESSOR REMOVAL AND INSTALLATION

3-60. General

a. Either the engine or compressor of these units may be replaced as individual and complete units. They are bolted to the mounting base and connected to each other by a belt set.

b. The entire engine and compressor assembly on models BMW-452-ENG and BMW-452-ENG-1 may be removed by removing the nuts (1, fig. 3-9) and bolts (2) from the base (3).

c. On models BMW-452-ENG and BMW-452-ENG-1 the entire shroud assembly must be removed first as shown in figure 3-24 and as follows:

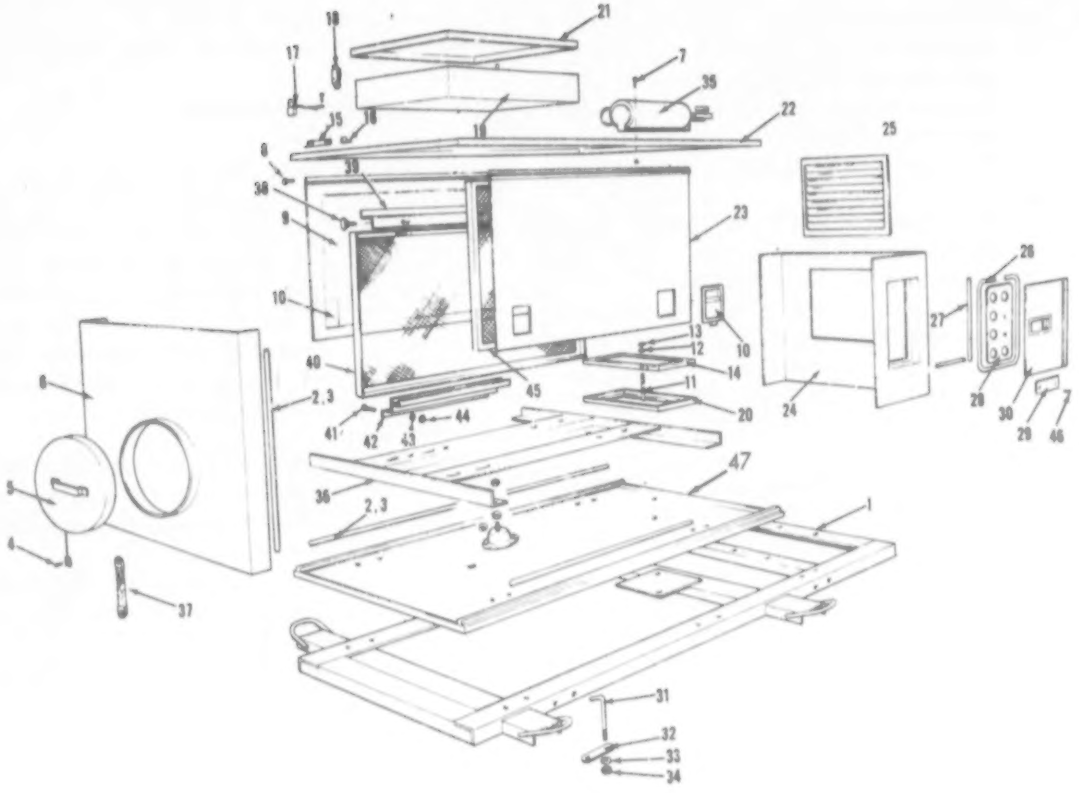
(1) Remove the screws (8) and remove top enclosure (22).

(2) Remove door enclosures (9 and 23).

(3) Remove fastener (38) and then remove guards (40 and 45).

(4) Remove the screws (8) and remove dust end enclosure (7) and louver end enclosure (24).

(5) Remove nuts (34), washers (33), anchor plates (32), anchor bolts (31), and then remove base channel assembly (1).



MSC 4310-227-15/28

1	Base channel assembly
2	Rivet
3	Weather seal
4	Screw, machine
5	Dust cover
6	Dist end enclosure
7	Sems fastener
8	Screw, machine
9	Door enclosure
10	Door latches
11	Stud, battery holddown
12	Washer
13	Nut
14	Frame, battery holddown
15	Door hook enclosure
16	Door hook latch enclosure
17	Padlock
18	Tool box cover latch
19	Tool box
20	Battery box
21	Tool box cover
22	Top enclosure
23	Door enclosure
24	Louver end enclosure
25	Adjustable louver assembly
26	Weather strip
27	Locking strip
28	Instrument panel assembly
29	Identification plate
30	Instrument panel door
31	Anchor bolt
32	Anchor plate
33	Lockwasher
34	Nut
35	Fire extinguisher
36	Pump and engine rail assembly
37	Ground strap
38	Fastener
39	Bracket
40	Guard
41	Screw
42	Bracket
43	Lockwasher
44	Nut
45	Guard
46	Drive screw
47	Bottom pan

Figure 3-24. Shroud, supporting platform, access doors, instrument panel, exploded view.

3-61. Engine

a. Removal.

(1) Remove the belt set (para 3-59).

(2) Remove the four nuts (1, fig. 3-21), lockwashers (3), and capscrews (2) that secure the cylinder and crankcase assembly to the mounting base (4). Lift the engine from the mounting base.

(3) For models BMW-452-ENG and BMW-452-ENG-1 also remove ground cable (10, fig. 3-17), governor control cable, choke lever cable, tag and disconnect electrical cables and wires, remove fuel line (para 3-34) and remove drain plug and fittings (para 3-65).

b. Installation.

(1) Position the cylinder and crankcase assembly on the mounting base (4) and install the four capscrews (2), lockwashers (3), and nuts (1).

(2) For models BMW-452-ENG and BMW-452-ENG-1 also install strap (10, fig. 3-17), governor control cable and choke control cable (para 3-4), electrical cables and wires, fuel line (para 3-34), and drain plug and fittings (para 3-65).

(3) Install the belt set (para 3-59).

3-62. Compressor Assembly

a. Removal.

(1) Remove the belt set (para 3-59).

(2) Loosen the coupling nut (2, fig. 3-25) that secures the aftercooler tube (1) to the aftercooler manifold (3).

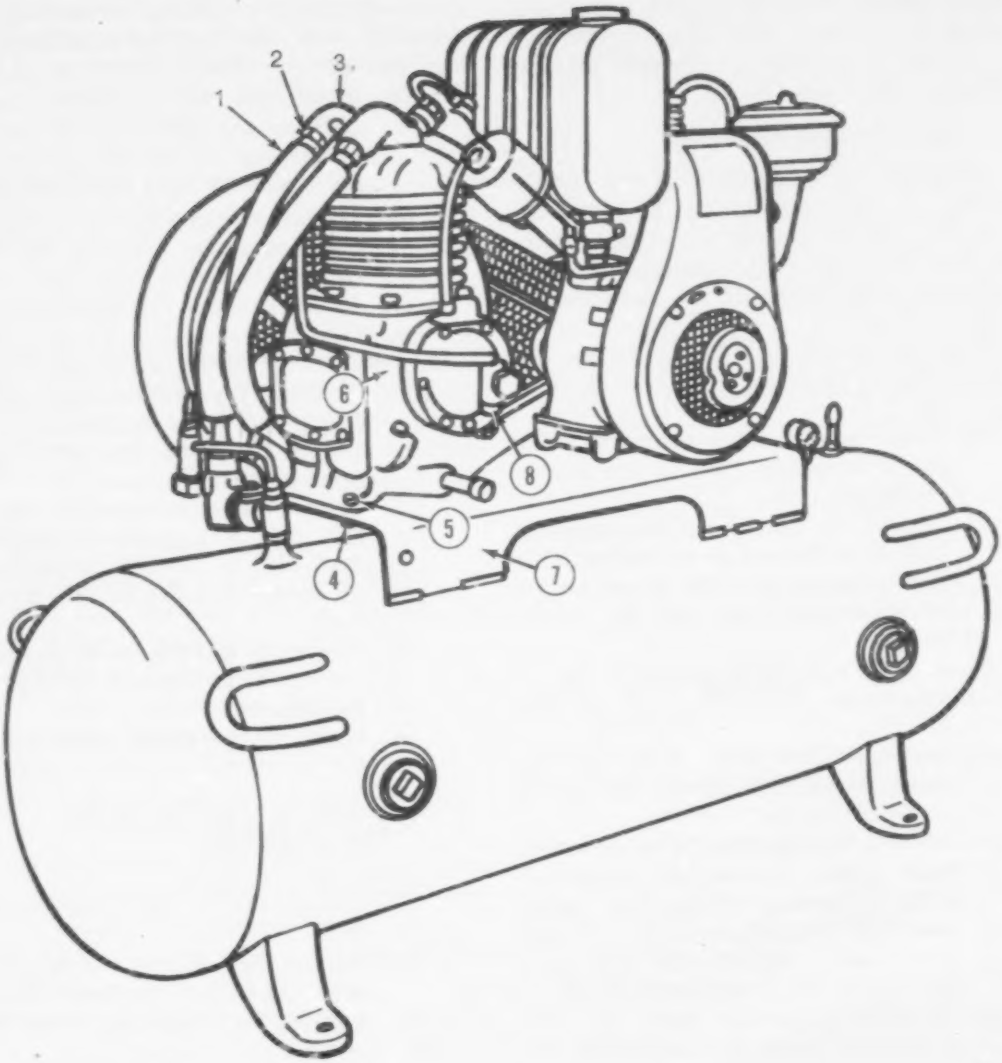
(3) Remove the four bolts (4), flat washers, lockwashers, and nuts (5) that secure the compressor assembly (6) to the mounting base (7) and lift off the compressor assembly.

b. Installation.

(1) Position the compressor assembly (6) on the mounting base (7) and secure with the four bolts (4), flat washers, lockwashers, and nuts (5).

(2) Tighten the coupling nut (2) that secures the after-cooler tube (1) to the aftercooler manifold (3).

(3) Install and adjust the belt set (para 3-59).



1 Aftercooler tube
2 Nut, coupling
3 Aftercooler manifold
4 Bolt
5 Nut
6 Compressor
7 Mounting base
8 Oil sight indicator

Figure 3-25. Compressor assembly, removal points.

Section XI. ENGINE

3-63. General

These units are equipped with a single-cylinder, 4-cycle, L-head, air-cooled, gasoline-driven engine. The engine is manually started on models OEG-458-ENG-1 and OEG-458-ENG-2 by use of a starting rope and pulley assembly mounted on the front of the engine crankshaft. Models BMW-452-ENG-1 have

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an electric starter and generator. The engine utilizes a plunger type oil pump, centrifugal flyball type governor, and magneto ignition. Refer to TM 5-2805-203-14 for data applicable to model OEG-458-ENG-3.

3-64. Starting Pulley Assembly

a. Removal (OEG-458-ENG-1 and OEG-458-ENG-2). Remove the starting pulley assembly (29, fig. 2-7) from the engine crankshaft (16) by turning the starting pulley assembly counterclockwise off the crankshaft.

b. Removal (Model BMW-452-ENG).

(1) Remove generator drive belt (para 3-47).

(2) Loosen setscrew that secures starting pulley assembly (29) to the engine crankshaft (16).

(3) Remove the starting pulley assembly (29) from the engine crankshaft (16) by turning the starting pulley assembly counterclockwise off the crankshaft.

c. Removal (Model BMW-452-ENG-1).

(1) Remove generator drive belt (para 3-47).

(2) Loosen setscrew that secures starting pulley assembly (29) to the engine crankshaft (16).

(3) Remove the starting pulley assembly (29) from the engine crankshaft (16) by turning the starting pulley assembly counterclockwise off the crankshaft. Remove the lockwasher (3, fig. 3-18) from the crankshaft.

(4) Remove the grooved taper pin (28) that secures the starting pulley (1) to the nut and shaft extension (2). Separate the pulley from the nut and shaft extension.

d. Cleaning and Inspection.

(1) Clean all parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect the pulley and nut and shaft extension for cracks, breaks, and loose fit. Inspect the taper pin for loose fit.

(3) Replace all defective parts.

e. Installation (Model OEG-458-ENG-1 and OEG-458-ENG-2). Install the starting pulley assembly (29, fig. 2-7) on the engine crankshaft (16) by turning the starting pulley assembly clockwise onto the crankshaft.

f. Installation (Model BMW-452-ENG).

(1) Install the starting pulley assembly (29) on the engine crankshaft (16) by turning the starting pulley assembly clockwise onto the crankshaft.

(2) Tighten setscrew that secures starting pulley assembly (29) to the engine crankshaft (16).

(3) Install generator drive belt (para 3-47).

g. Installation (Model BMW-452-ENG-1).

(1) Position the starting pulley (1, fig. 3-18) on the nut and shaft extension (2) and secure by installing the grooved taper pin.

(2) Install the starting pulley assembly (29, fig. 2-7) on the engine crankshaft (16) by turning the starting pulley assembly clockwise onto the crankshaft.

(3) Secure the starting pulley assembly to the engine crankshaft by tightening the setscrew.

(4) Install the generator drive belt (para 3-47).

3-65. Engine Oil Filler Plug, Drain Plug and Fittings

a. Removal.

(1) Remove the oil filler plug (7, fig. 3-21).

(2) Remove the oil drain plug (6) and drain the oil into a suitable container.

(3) Remove the nipple (5) from the engine.

(4) Remove the elbow from the engine base on models BMW-452-ENG and BMW-452-ENG-1.

b. Cleaning and Inspection.

(1) Clean all parts in an approved cleaning solvent and dry thoroughly.

(2) Inspect the engine, plugs, and fittings for damaged threads.

(3) Replace all defective parts.

c. Installation.

(1) Install the elbow in the engine base on models BMW-452-ENG and BMW-452-ENG-1.

(2) Install the nipple (5).
(3) Install the oil drain plug (6).
(4) Fill the engine base with the proper grade of oil. Refer to the current lubrication order. Install the oil filler plug (7).

3-66. Engine Drive Pulley

a. Removal (Models OEG-458-ENG-1, OEG-458-ENG-2, OEG-458-ENG-3 and BMW-452-ENG-1).

(1) Remove the belt set (para 3-59).
(2) Remove the screws (1, fig. 3-26) that secure the pulley (6) to the hub (3).
(3) Install the same screws (1) in the threaded holes (2) in the hub (3). Tighten screws alternately until hub is removed from the crankshaft (4).
(4) Remove the pulley (6) and key (5).

b. Removal (Model BMW-452-ENG).

(1) Remove the belt set (para 3-59).
(2) Loosen the setscrew (14, fig. 2-7) located in the groove of the pulley.
(3) Use a suitable puller and remove the pulley from the crankshaft (16). Remove the key.

c. Cleaning and Inspection.

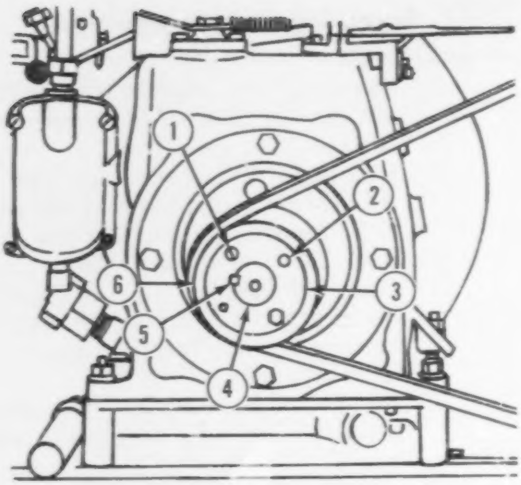
(1) Clean all parts in an approved cleaning solvent and dry thoroughly.
(2) Inspect all parts for cracks, chips, damaged threads, or other damage.
(3) Replace all defective parts.

d. Installation (Models OEG-458-ENG-1 and BMW-452-ENG-1).

(1) Position the key (5, fig. 3-26) on the crankshaft (4) and install the pulley (6) and hub (3).
(2) Aline the holes in the pulley and hub and install the two screws (1). Tighten the screws alternately until the pulley and hub are secure.
(3) Install the belt set (para 3-59).

e. Installation (Model BMW-452-ENG).

(1) Position the key on the crankshaft (16, fig. 2-7) and the pulley.
(2) Tighten the setscrew (14) located in the groove of the pulley.
(3) Install the belt set (para 3-59).



1 Screw	4 Crankshaft
2 Threaded hole	5 Key
3 Hub	6 Engine drive pulley

Figure 3-26. Engine drive pulley, Models OEG-458-ENG-1, OEG-458-ENG-2, and BMW-452-ENG-1, removal points.

3-67. Intake Manifold

a. Removal.

(1) Remove the carburetor (para 3-37).
(2) Remove the two bolts (1, fig. 2-7) and lockwashers (2) that secure the intake manifold (4) to the engine cylinder and crankcase assembly (18). Remove the manifold and gasket (3). Remove the plug (35) from the manifold.

b. Cleaning and Inspection.

(1) Clean the manifold in an approved cleaning solvent and dry thoroughly.
(2) Inspect the manifold for cracks, breaks, and other damage.
(3) Inspect the gasket for damage. Replace all defective parts as necessary.

c. Installation.

(1) Install the plug (35) in the intake manifold (4) and secure the manifold and gasket (3) to the engine cylinder and crankcase assembly (18) with the two bolts (1) and lockwashers (2). Torque the bolts to 9-foot-pounds.
(2) Install the carburetor (para 3-37).

3-68. Engine Crankcase Breather Line

a. Removal.

(1) Disconnect the breather line coupling nut (11, fig. 3-2), from the crankcase breather line elbow (12).

(2) Disconnect the coupling nut from the air cleaner bracket breather line elbow (12). Remove the breather line (10).

b. Cleaning, Inspection, and Repair.

(1) Clean the breather line in approved cleaning solvent and dry thoroughly. Be sure that the breather line is free from restrictions.

(2) Inspect the breather line for cracks, breaks, bends, and damaged threads.

(3) Repair or replace the breather line as necessary.

c. Installation.

(1) Connect the coupling nut (11) to the crankcase breather line elbow (12).

(2) Connect the coupling nut to the air cleaner bracket breather line elbow (12).

3-69. Valves

a. Valve Chamber Cover Removal.

(1) Remove the air cleaner, bracket carburetor, and intake manifold assembly (para 3-38, 3-37, and 3-67).

(2) Remove the fuel strainer to-carburetor tube (para 3-34).

(3) Remove the bolt (4, fig. 3-27) and flat washer (3) that secure the valve chamber access cover (2) to the engine cylinder and crankcase assembly (1). Remove the valve cover gasket (13, fig. 3-18).

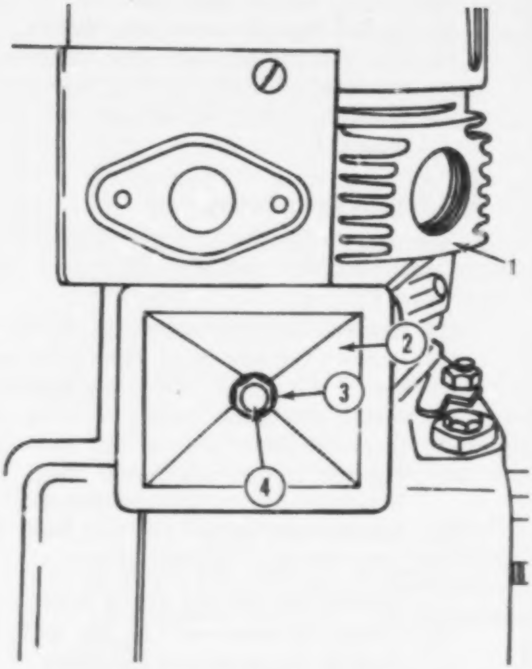
b. Cleaning and Inspection.

(1) Clean the valve cover in an approved cleaning solvent and dry thoroughly.

(2) Inspect the cover for cracks, breaks, dents, and other damage. Inspect the gasket for an unserviceable condition.

(3) Inspect the valve chamber for dirt and sludge and remove with a clean cloth dampened with an approved cleaning solvent.

(4) Replace all defective parts.



1 Cylinder and crankcase assembly
2 Valve chamber access cover
3 Washer, flat, copper, 5/16 in.
4 Bolt, machine, 5/16-18 x 2 in.

Figure 3-27. Valve chamber cover, removal points.

c. Valve Adjustment.

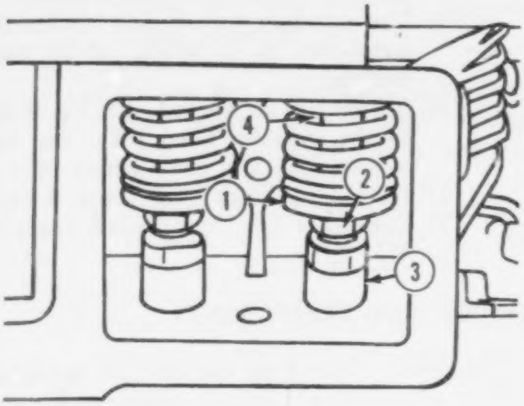
(1) Disconnect the ignition cable from the spark plug (para 3-45).

(2) Rotate the engine crankshaft until the valve lifter is at its lowest position.

(3) Insert a feeler gage between the valve (1, fig. 3-28) and the lifter adjustment screw (2). The correct clearance with the engine cold is 0.008 inch for the intake valve and 0.016 inch for the exhaust valve.

(4) To obtain the correct clearance, hold the valve lifter (3) and turn the adjustment screw (2) until the feeler gage has a slight drag when it is withdrawn. The adjusting screw is self-locking and will remain at the set position.

(5) Measure and adjust the other valve in the same manner.



1 Valve rotator (2 rqr)
2 Valve lifter adjustment screw (2 rqr)
3 Valve lifter (2 rqr)
4 Valve (2 rqr)

Figure 3-28. Valve lifter, adjustment points.

d. Valve Chamber Cover Installation.

(1) Secure the valve chamber access cover (14, fig. 3-18) and gasket (13) to the cylinder and crankcase assembly (17) with the flat washer (16) and bolt (15).

(2) Install the air cleaner, bracket, carburetor, and intake manifold as an assembly (para 3-38, 3-37, and 3-67).

(3) Install the fuel strainer - to - carburetor tube (para 3-34).

3-70. Engine Cylinder Head

a. Removal.

(1) Remove the fuel tank bracket (para 3-35).

(2) Remove the spark plug (para 3-44).

(3) Remove the two screws (9, fig. 3-2) and lockwashers (8) that secure the air shroud (22) to the cylinder head (6).

(4) Remove the 3 capscrews (31, fig. 2-8), 2 capscrews (33) and 5 lockwashers (5) that secure the cylinder head (32) to the cylinder and crank case assembly (19).

Note. Be sure to note the different lengths of the cylinder head cap screws, as they are removed, to facilitate correct installation.

(5) Remove the cylinder head and gasket (33, fig. 3-18) from the cylinder and crankcase assembly (17).

(6) Remove the cylinder head stud (5) from the cylinder and crankcase assembly, only if necessary.

b. Cleaning and Inspection.

(1) Clean all metal parts in an approved cleaning solvent and dry thoroughly. Use a wire brush and remove all carbon deposits from the cylinder head.

(2) Rotate the engine until the piston reaches its highest point of travel. Brush the carbon deposits from the top of the piston.

Note. Avoid spilling dirt around the valves and valve seats.

(3) Inspect the cylinder head for cracks, breaks, and warped condition. Inspect the spark plug hole and cylinder head capscrews for damaged threads. Replace a defective part.

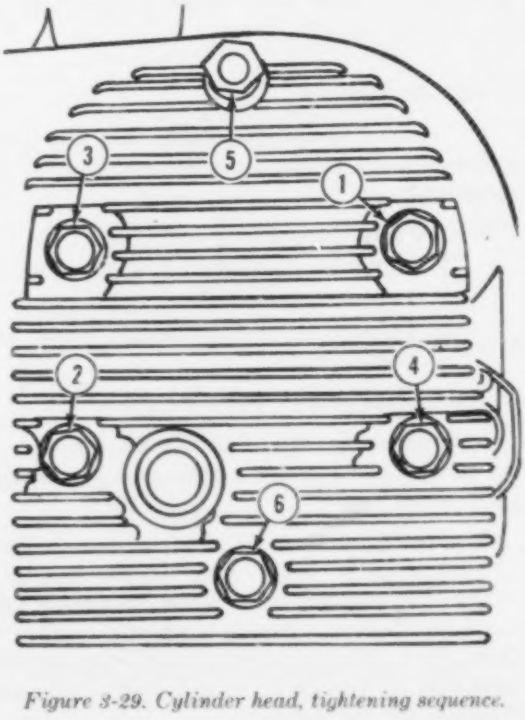


Figure 3-29. Cylinder head, tightening sequence.

c. Installation.–

(1) Install the cylinder head stud (5) in the cylinder and crankcase assembly (17) if removed.

(2) Position a new cylinder head gasket (33) on the cylinder and crankcase assembly. Place the cylinder head on the gasket with the holes alined.

(3) Install the five capscrews ((7 and 8), according to length, with lockwashers and gradually tighten in the proper sequence as shown in fig. 3–29).

(4) Use a torque wrench and tighten the capscrews to a torque of 32 foot-pounds.

(5) Secure the air shroud (22, fig. 3–18) to the cylinder head with the two screws (32) and lockwashers (31).

(6) Install the spark plug (para 3–44).

(7) Install the fuel tank bracket (para 3–35).

Section XII. COMPRESSOR ASSEMBLY AND COMPONENTS

3–71. General

The compressor assembly is a 2–cylinder, 2–stage, air cooled, reciprocating type compressor. Air is drawn through the air cleaner into the low-pressure cylinder. From the low-pressure cylinder the air is forced through the intercooler tube, where it is cooled, to the high pressure cylinder. The compressed air is then discharged into the aftercooler manifold, through the check valve into the air receiver tank. The check valve prevents the air in the air receiver tank from flowing back into the after-cooler manifold.

3–72. Air Cleaner

a. Removal and Disassembly. Refer to paragraph 3–6 for removal and disassembly of the air cleaner.

b. Cleaning, Inspection, and Repair.

(1) Refer to paragraph 3–6 for cleaning instructions.

(2) Inspect for cracks, breaks, dents, and torn threads.

(3) Replace any defective parts.

c. Reassembly and Installation. Refer to paragraph 3–6 for reassembly and installation procedures.

d. Field Expedient Repairs. If the air compressor fails to build up pressure due to a clogged air cleaner, remove the air cleaner (see *a* above). Securely fasten a suitable section of clean, fine, meshed screen, if available, over the open end of the manifold and operate the unit without the air cleaner.

***Caution:* Operating the unit in sandy or dusty areas without the air cleaner can cause damage to the air compressor.**

3–73. Pipe Cap, Pipe Nipple, and Oil Filler Plug

a. Removal.

(1) Remove the pipe cap (19, fig. 3–30) from the pipe nipple (20) and drain the oil from the crankcase (21).

(2) Remove the pipe nipple (20) from the crankcase.

(3) Remove the oil filler plug (18) from the crankcase.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, worn threads, and other damage. Replace a damaged part.

c. Installation.

(1) Install the pipe nipple (20) in the crankcase (21) and install the pipe cap (19) on the pipe nipple.

(2) Add oil to the crankcase as specified in the lubrication order.

(3) Install the oil filler plug (18) in the crankcase.

3–74. Breather Tube and Unloader Tubing

a. Removal.

(1) *Breather tube.*

(*a*) Loosen the compression nuts (7, fig. 3–30) that secure the breather tube (8) to the adapter (12) and to the elbow (6), and remove the breather tube.

(*b*) Remove the adapter (12) from the unloader body (16) and remove the elbow (6) from the low pressure intake manifold (5).

(2) *Unloader tubing.*

(*a*) Loosen the compression nuts (14) that secure the unloader tubing (36) to the elbows (15) and remove the unloader tubing.

(*b*) Remove the elbows (15) from the housing cover (13) and the high pressure exhaust manifold (1).

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the tube and tubing for cracks breaks, or other damage.

(3) Inspect all other parts for cracks, breaks, worn threads, or other damage. Replace a damaged part.

c. Installation.

(1) *Breather tube.*

(*a*) Install the adapter (12) in the unloader body (16) and install the elbow (6) in the low-pressure intake manifold (5).

(*b*) Connect the breather tube (8) to the adapter (12) and to the elbow (6) and secure by tightening the compression nuts (7).

(2) *Unloader tubing.*

(*a*) Install the elbows (15) in the housing cover (13), and in the high uressure exhaust manifold (1).

(*b*) Connect the unloader tubing (36) to the elbows (15), and secure by tightening the compression nuts (14).

3-75. Flywheel

a. Removal.

(1) Remove the belt set (para 3-59).

(2) Remove the bolt (3, fig. 3-17) and nut (6) that lock the compressor flywheel (7) on the crankshaft (5) and use a suitable puller to remove the compressor flywheel.

(3) Remove the machine key (4) from the keyway in the crankshaft.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the flywheel for cracks, wear, distortion, wear in the grooves or keyway, and other damage. Replace if defective.

(3) Inspect the machine key and the key way in the shaft for burrs, wear, or other damage. File off all burrs, or replace the key if necessary.

(4) Inspect all other parts for cracks, breaks, or damaged threads. Replace damaged part.

c. Installation.

(1) Install the machine key (4) in the keyway in the crankshaft (5).

(2) Install the compressor flywheel (7) on the crankshaft, and lock with the bolt (3) and nut (6).

(3) Install and adjust the belt set (para 3-59).

3-76. Low-Pressure Safety Valve

a. Removal.

(1) Remove the low pressure safety valve (1, fig. 3-17) from the elbow on the high pressure intake manifold (12).

(2) Remove the elbow from the high pressure intake manifold.

b. Cleaning and Inspection.

(1) Install the elbow in the high pressure cleaning solvent and dry thoroughly.

(2) Inspect both parts for cracks, breaks, worn threads, or other damage. Replace if damaged.

c. Installation.

(1) Install the elbow in the high pressure intake manifold (12).

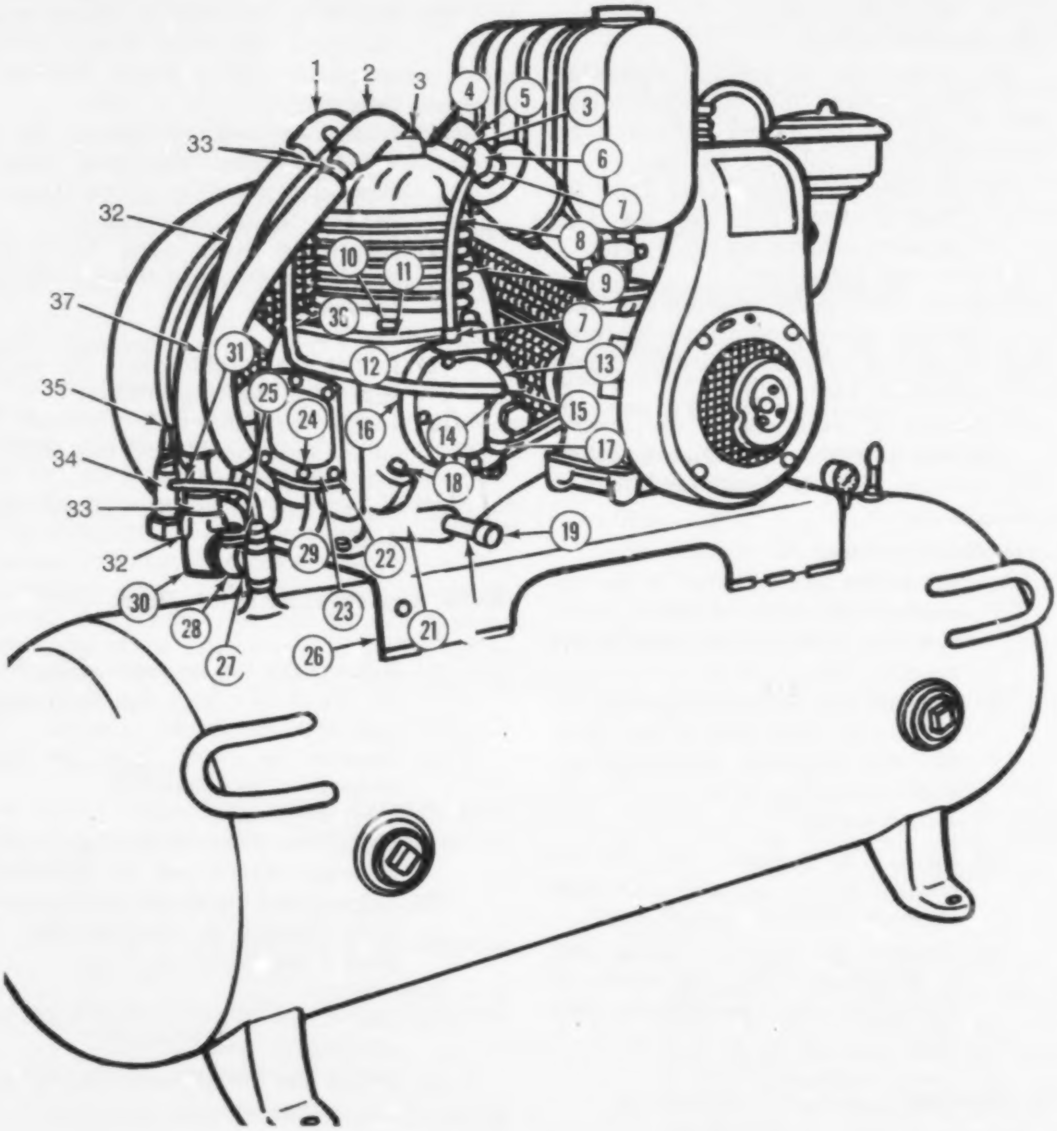
(2) Install the low-pressure safety valve (1) in the elbow.

3-77. Access Cover Plate and Oil Sight Indicator

a. Removal.

(1) Drain the compressor crankcase (para 3-73).

(2) Remove the six screws (24, fig. 3-30) that secure the access cover plate (23) to the crankcase (21) and remove the



1 High-pressure exhaust manifold
2 Low-pressure exhaust manifold
3 Nut, hex, 3/8-24 (6 rqr)
4 Stud, 3/8-24 (6 rqr)
5 Low-Pressure intake manifold
6 Elbow, 1/4 in. pipe to 3/8 in. tubing
7 Nut, compression, 3/8 in. (2 rqr)
8 Breather tube
9 Cylinder
10 Stud, 7/16-20 x 1-1/2 in. (6 rqr)
11 Nut, 7/16-20 (6 rqr)
12 Adapter, 1/4 NPT to 3/8 in. tubing
13 Housing cover
14 Nut, compression. 1/4 in. (2 rqr)

Figure 3-30. Compressor components, model OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3, removal points.

15 Elbow, 908, 1/8 NPT to 1/4 in. tubing
16 Unloader body
17 Air muffler
18 Oil filler plug
19 Cap, pipe, 3/8-18
20 Nipple, pipe, 3/8-18 × 6 in.
21 Crankcase
22 Cover plate gasket (2 rqr)
23 Access cover plate (2 rqr)
24 Screw, cap, hex-hd, 5/16-18 × 1 in. (12 rqr)
25 Bushing, pipe, 1/4 × 1/2 in.
26 Pipe tee
27 Nipple, pipe, 1/2 in.
28 Check valve
29 Nut, compression, 1/4 in. (2 rqr)
30 Aftercooler manifold
31 Sensing tube
32 Nipple, pipe, 1/4-18 × 2 in.
33 Compression nut (3 rqr)
34 Unloader valve
35 Adjusting nut
36 Unloader tubing
37 Intercooler tube
38 Aftercooler tube

Callouts For Figure 3-30—Continued.

access cover plate and cover plate gasket (22). Remove the other access cover plate in the same manner.

(3) Drive the oil sight indicator (8, fig. 3-25) from the crankcase using a round piece of wood of the same diameter as the oil sight indicator.

Note. Do not remove the oil sight indicator unless it is leaking or defective.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the oil sight indicator for cracks or breaks. Replace if defective.

(3) Inspect all other parts for cracks, breaks, worn threads, or other damage.

c. Installation.

(1) Coat the outer edges of the oil sight indicator (8) with a light coat of sealing compound and turn the indicator so that when positioned on the crankcase (21, fig. 3-30), the line on the indicator runs parallel to the bottom of the crankcase. Press the oil sight indicator into the recessed hole in the crankcase.

(2) Position the access cover plate (23) and cover plate gasket (22) on the crankcase and secure with the six screws (24). Tighten to 24 ft-lb torque. Install the remaining access cover plate in the same manner.

(3) Add oil to the crankcase as specified in the lubrication order.

3-78. Centrifugal Unloader

a. Removal and Disassembly.

(1) Disconnect the breather tube and unloader tubing from the centrifugal unloader (para 3-74).

(2) Remove the air muffler (17, fig. 3-30) from the housing cover (13).

(3) Remove the screen (23, fig. 3-31) and packing (24) from the air muffler.

(4) Remove the release valve cap (1) from the release valve body (4).

(5) Remove the release valve body (4) from the housing cover (21) and remove the release valve gasket (5) from the release valve body.

(6) Tilt the release valve body (4) and the spring (2) and the bearing ball (3) will drop out.

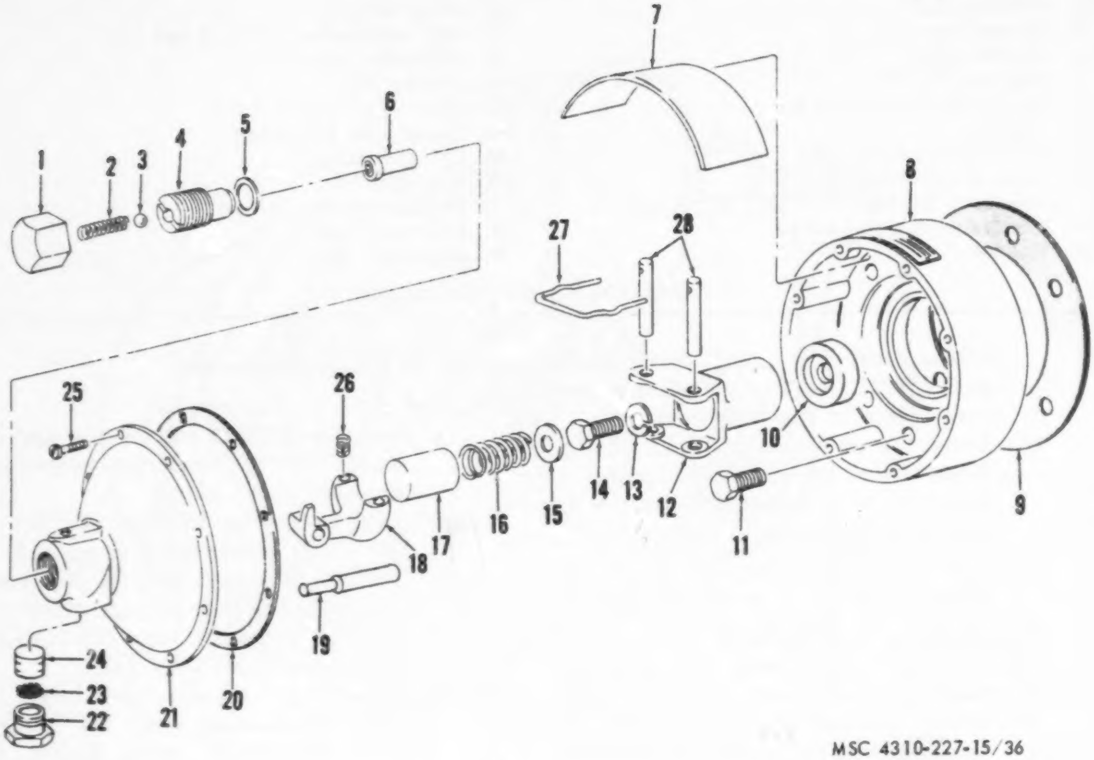
(7) Remove the six screws (52) that secure the housing cover (21) to the unloader body (8) and remove the housing cover and cover gasket (20). Discard the cover gasket.

(8) Remove the valve plunger (19) and plunger sleeve (6) from the housing cover (21).

(9) Remove the 2 lockwires (27) from the 2 weight pins (28) and remove the weight pins from the spindle (12). This will release the 2 weights (18), the spring sleeve (17), spring (16), and 2 flat washers (15) from the spindle (12).

(10) Remove the two bumper springs (26) from the weights (18).

(11) Remove the screw (14) and lockwasher (13) that secure the spindle



MSC 4310-227-15/36

1	Release valve cap	15	Washer, flat, 3/8 in. (2 rqr)
2	Spring	16	Spring
3	Bearing ball	17	Spring sleeve
4	Release valve body	18	Weight (2 rqr)
5	Release valve gasket	19	Valve plunger
6	Plunger sleeve	20	Cover gasket, 1/32 in. thk
7	Baffle plate	21	Housing cover
8	Unloader body	22	Muffler
9	Body gasket (as rqr)	23	Screen
10	Spindle washer	24	Packing
11	Screw, cap, hex-hd, 3/8-16 × 1 in. (4 rqr)	25	Screw, machine, 10-32 × 3/8 in. (6 rqr)
12	Spindle	26	Bumper spring (2 rqr)
13	Washer, lock 7/16 in.	27	Lockwire (2 rqr)
14	Screw, cap, hex-hd, 7/16-20 × 1 1/4 in.	28	Weight pin (2 rqr)

Figure 3-31. Centrifugal unloader, exploded view.

(12) to the crankshaft. Remove the spindle and spindle washer (10).

(12) Remove the four screws (11) that secure the unloader body (8) to the crankcase (21, fig. 3-30) and remove the unloader body and body gaskets (9, fig. 3-31). Discard the body gaskets.

(13) Remove the baffle plate (7) from the unloader body (8).

b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, worn threads, and other damage. Replace a damaged part.

c. Reassembly and Installation.

(1) Install the baffle plate (7) in the unloader body (8).

(2) Position new body gaskets (9) and the unloader body (8) on the crankcase (21, fig. 3-30) and secure it with the four screws (11, fig. 3-31). Tighten the screws to 29 ft-lb torque.

(3) Install the spindle (12) and spindle washer (10) on the crankshaft and secure with the screw (14) and lockwasher (13).

(4) Install the two flat washers (15), the spring (16), and spring sleeve (17) in the spindle.

(5) Install a bumper spring (26) in each weight (18).

(6) Install the weights (18) on the spindle (12) and install the weight pins (28) and lockwires (27) in the weights and spindle.

(7) Install the plunger sleeve (6) in the housing cover (21) and install the valve plunger (19) in the plunger sleeve.

(8) Install a new cover gasket (20) and the housing cover (21) on the unloader body (8) and secure with the six screws (25).

(9) Insert the bearing ball (3) and spring (2) into the release valve body (4).

(10) Install the release valve gasket (5) on the release valve body (4) and install the release valve body in the housing cover (21).

(11) Install the release valve cap (1) on the release valve body. Tighten the cap securely to prevent any leakage of air.

(12) Install the screen (23) and packing (24) in the air muffler (22) and install the air muffler in the housing cover (21).

(13) Connect the breather tube and unloader tubing to the centrifugal unloader (para 3-78).

3-79. Intake and Exhaust Manifolds

a. Removal. Stop the engine, and release all air from the air receiver tank by opening the draincock.

(1) *Low pressure intake manifold.*

(*a*) Remove the air cleaner (para 3-6).

(*b*) Loosen the nut (7, fig. 3-30) that secures the breather tube (8) to the elbow (6) on the low pressure intake manifold (5). Disconnect the breather tube from the elbow and remove the elbow.

(*c*) Remove the two nuts (3) that secure the low pressure intake manifold to the studs (4) on the cylinder (9) and remove the low pressure intake manifold and the studs.

(2) *Low pressure exhaust manifold.*

(*a*) Remove the two nuts (3) that secure the low pressure exhaust manifold (2) to the studs (4) on the cylinder (9).

(*b*) Loosen the nut (33) that secures the intercooler tube (37) to the low pressure exhaust manifold (2) and remove the low pressure exhaust manifold and the two studs.

(3) *High pressure intake manifold.*

(*a*) Remove the low pressure safety valve (para 3-76).

(*b*) Remove the two nuts (14, fig. 3-17) that secure the high-pressure intake manifold (12) to the studs (13) on the cylinder.

(*c*) Loosen the coupling nut (15) that secures the intercooler tube to the high pressure intake manifold (12) and remove the high pressure intake manifold and the two studs.

(4) *High-pressure exhaust manifold.*

(*a*) Loosen the compression nut (14, fig. 3-30) that secures the unloader tubing (36) to the elbow (15) on the high pressure exhaust manifold (1). Disconnect the unloader tubing and remove the elbow.

(*b*) Remove the two nuts (3) that secure the high pressure exhaust manifold to the studs (4) on the cylinder (9).

(*c*) Loosen the nut (33) that secures the aftercooler tube (38) to the high-pressure exhaust manifold (1) and remove the high pressure exhaust manifold and two studs.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, worn threads, or other damage. Replace a damaged part.

c. Installation.

(1) *Low pressure intake manifold.*

(*a*) Install the 2 studs (4) in the cylinder (9), install the low pressure intake manifold (5) on the studs, and secure with the 2 nuts (3).

(*b*) Install the elbow (6) in the low pressure intake manifold (5), connect the breather tube (8) to the elbow, and tighten the compression nut (7).

(2) *Low pressure exhaust manifold.*

(*a*) Install the two studs (4) in the cylinder (9) and install the low pressure exhaust manifold (2) on the studs and on the intercooler tube (37). Tighten the coupling nut (33) that secures the intercooler tube to the low pressure exhaust manifold.

(*b*) Install the two nuts (3) on the studs (4).

(3) *High-pressure intake manifold.*

(*a*) Install the two studs (13), fig. 3-17) in the cylinder and install the high-pressure intake manifold on the studs and on the intercooler tube. Tighten the nut (15) that secures the intercooler to the high-pressure intake manifold.

(*b*) Install the two nuts (14) on the studs.

(*c*) Install the low pressure safety valve (para 3-76).

(4) *High pressure exhaust manifold.*

(*a*) Install the two studs (4, fig. 3-30) in the cylinder (9) and install the high pressure exhaust manifold (1) on the studs and on the aftercooler tube (38). Tighten the nut (33) that secures the aftercooler tube to the high-pressure exhaust manifold.

(*b*) Install the two nuts (3) on the studs (4).

(*c*) Install the elbow (15) in the high-pressure exhaust manifold, connect the unloader tubing (36) to the elbow and tighten the compression nut (14).

3-80. Intercooler Tube

a. Removal.

(1) Remove the compressor flywheel (para 3-75).

(2) Loosen the nuts (33, fig. 3-30) that secure the intercooler tube (37) to the low pressure exhaust manifold (2) and the high-pressure intake manifold (12, fig. 3-17), and remove the intercooler tube.

(3) Remove the coupling nuts and ferrules from the intercooler tube.

Note. Remove these parts only if they need to be replaced.

b. Cleaning and Inspection.

(1) Clean the intercooler tube with an approved cleaning solvent and dry the interior and the fins with compressed air.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the intercooler tube for bent or broken fins, dents, holes, cracks, and damaged threads. Replace if defective.

(4) Inspect all other parts for cracks, breaks, or other damage. Replace a damaged part.

c. Installation.

(1) Install the nuts (33, fig. 3-30) and ferrules on the intercooler tube (37).

(2) Connect the intercooler tube to the low-pressure exhaust manifold (2) and the high pressure intake manifold (12, fig. 3-17) and secure by tightening the coupling nuts.

(3) Install the compressor flywheel (para 3-75).

3-81. Aftercooler Tube

a. Removal.

(1) Remove the high-pressure exhaust manifold (para 3-79).

(2) Loosen the nut (33, fig. 3-30) that secures the aftercooler tube (38) to the aftercooler manifold (30) and remove the aftercooler tube.

(3) Remove the coupling nuts and ferrules from the aftercooler tube.

Note. Remove these parts only if they need to be replaced.

b. Cleaning and Inspection.

(1) Clean the aftercooler tube with an approved cleaning solvent and dry the interior and the fins with compressed air.

(2) Clean all other parts with an approved cleaning solvent and dry thoroughly.

(3) Inspect the aftercooler tube for bent or broken fins, dents, holes, cracks, and damaged threads. Replace if defective.

(4) Inspect all other parts for cracks, breaks, or other damage. Replace a damaged part.

c. Installation.

(1) Install the compression nuts (33) and ferrules on the aftercooler tube (38).

(2) Connect the aftercooler tube to the aftercooler manifold (30) and secure by tightening the compression nut (33).

(3) Install the high-pressure exhaust manifold (para 3-79).

3-82. Intake and Exhaust Valves

a. Removal and Disassembly.

(1) Remove the intake and exhaust manifolds (para 3-79).

(2) Remove the copper gaskets (7 and 10, fig. 3-32) and the high pressure exhaust valve assembly from the cylinder (11).

(3) Remove the screw (1) and lockwasher (6) and remove the high pressure exhaust valve seat (23), high-pressure exnaust disk (24) and the high-pressure exhaust spring (25) from the high-pressure exhaust valve housing (26).

(4) Remove the low-pressure intake valve assembly and the copper gasket (22) from the cylinder.

(5) Remove the screw (16) and lockwasher (17) that secure the low-pressure intake valve seat (18) to the low - pressure intake valve housing (21) and remove the low pressure intake valve disk (19) and the low-pressure intake spring (20) from the low pressure intake valve seat (18).

(6) Remove the copper gaskets (12 and 14) and the low-pressure exhaust valve assembly from the cylinder.

(7) Remove the screw (1) and lockwasher (6) that secure the low pressure exhaust valve housing (13) to the low pressure exhaust seat (15) and remove the low pressure exhaust valve disk (3) from the low pressure exhaust valve seat.

(8) Remove the copper gaskets (7 and 10) and the high-pressure intake valve assembly from the cylinder.

(9) Remove the screw (1) and lockwasher (6) that secure the high-pressure intake valve seat (8) to the high-pressure intake valve housing (9) and remove the high - pressure intake spring (5) and the high-pressure intake disk (4) from the high-pressure intake valve seat.

b. Cleaning, Inspection and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all valve seats and housings for cracks, breaks, rough or scored valve seats, and mating surfaces. Replace if defective.

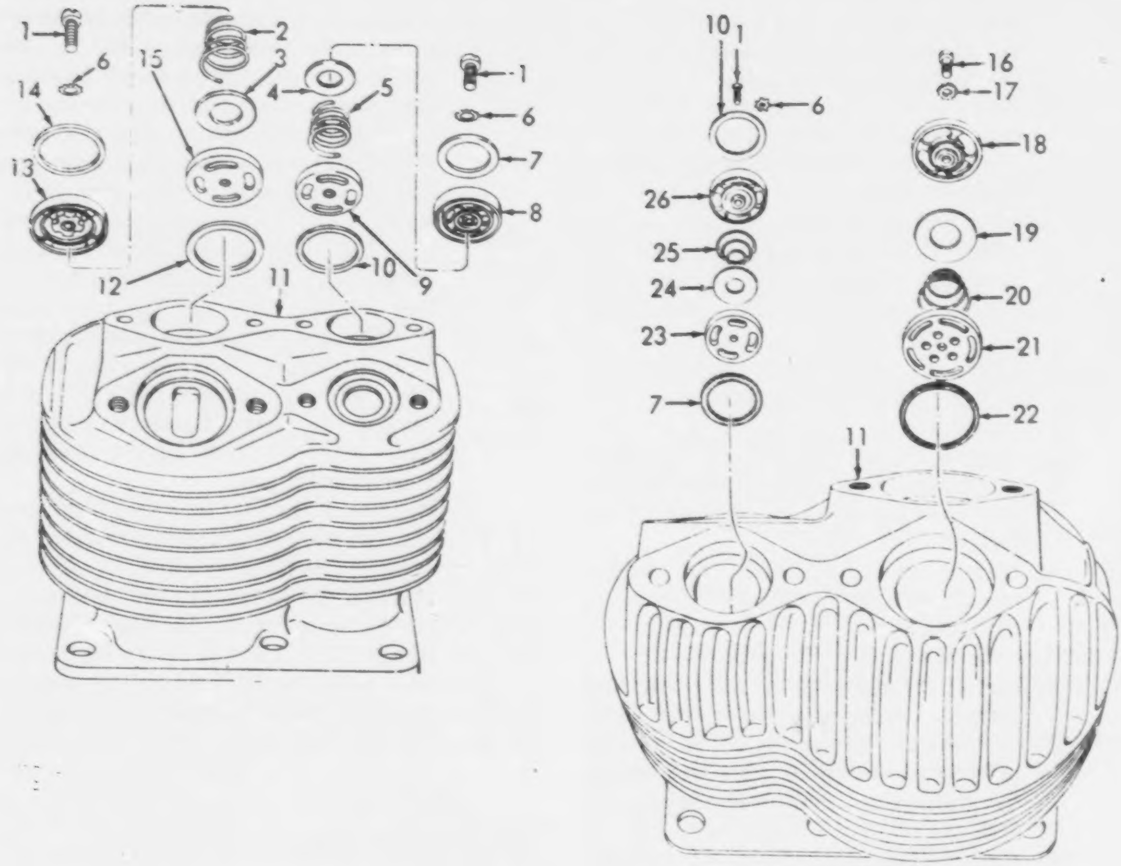
(3) Inspect the springs for distortion, weak tension, or broken coils. Replace if defective.

(4) Inspect the cylinder for defective valve assembly seats. Replace if defective.

(5) Inspect the copper gaskets for distortion or imprints that will render the gasket unserviceable. Replace if defective.

c. Reassembly and Installation.

(1) Position the high-pressure intake disk (4), the high pressure intake spring



MSC 4310-227-15/37

1	Screw, cap, rd-ht, slotted
2	Low-pressure intake spring
3	Low-pressure intake valve disk
4	High-pressure intake disk
5	High-pressure intake spring
6	Washer, lock, ET, No. 10 (3 rqr)
7	Gasket, copper, 1 1/8 in. (2 rqr)
8	High-pressure intake valve seat
9	High-pressure intake valve housing
10	Gasket, copper, 1 1/4 in. (2 rqr)
11	Cylinder
12	Gasket, copper, 1 1/4 in. (2 rqr)
13	Low-pressure intake valve housing
14	Gasket, copper, 1 23/32 in.
15	Low-pressure intake valve seat
16	Screw, 1/4-28 × 3/8 in.
17	Washer, lock, ET, 1/4 in.
18	Low-pressure exhaust valve seat
19	Low-pressure exhaust valve disk
20	Low-pressure exhaust valve spring
21	Low-pressure exhaust valve housing
22	Gasket, copper, 2 1/8 in. od, 5/64 in. thk
23	High-pressure exhaust valve seat
24	High-pressure exhaust disk
25	High-pressure exhaust spring
26	High-pressure exhaust valve housing

Figure 3-32. Intake and exhaust valves, exploded view.

(5), and the high-pressure intake valve housing (9) on the high-pressure intake valve seat (8) and secure with the lockwasher (6) and the screw (1).

(2) Install the copper gaskets (7 and 10) and the high pressure intake valve assembly in the cylinder (11).

(3) Position the low-pressure exhaust valve disk (3), the low-pressure

exhaust spring (2), and the low-pressure exhaust valve housing (13) on the low pressure exhaust valve seat (15) and secure with the lockwasher (6) and screw (1).

(4) Install the gaskets (12 and 14) and the low pressure exhaust valve assembly in the cylinder (11).

(5) Position the low-pressure intake valve disk (19), the low-pressure intake spring (20), and the low-pressure intake valve housing (21) on the low-pressure intake valve seat (18) and secure with the lockwasher (17) and screw (16).

(6) Install the gasket (22) and the low-pressure intake valve assembly in the cylinder (11).

(7) Position the high-pressure exhaust spring (25), the high-pressure exhaust disk (24), and the high pressure exhaust valve seat (23) on the high-pressure exhaust valve housing (26) and secure with the screw (1) and lockwasher (6).

(8) Install the gaskets (7 and 10) and the high-pressure exhaust valve assembly in the cylinder.

(9) Install the intake and exhaust manifolds (para 3–79).

3–83. Unloader Valve and Valve Tube

a. Removal.

(1) Remove the aftercooler tube (para 3–81).

(2) Loosen the compression nuts (29, fig. 3–30) that secure the sensing tube (31) to the unloader valve (34) on the bushing (25) and remove the sensing tube.

(3) Remove the unloader valve (34) from the bushing (25).

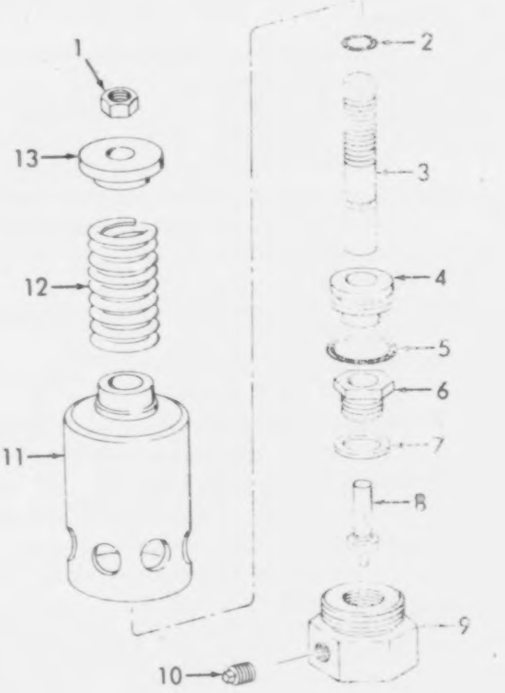
(4) Turn the aftercooler manifold (30) toward the front of the air compressor so the unloader valve cane be removed and remove the unloader valve and pipe nipple (32) from the aftercooler manifold.

(5) Remove the nipple (32) from the unloader valve.

b. Disassembly.

(1) Remove the pipe plug (10, fig. 3–33) from the lower body (9).

(2) Remove the nut (1) that secures the spring button (13) and spring (12) to the piston rod (3).



MSC 4310-227-15/33

1	**Nut, hex, 3/8–24**
2	**Piston rod packing**
3	**Piston rod**
4	**Piston**
5	**Piston packing**
6	**Body seat**
7	**Gasket**
8	**Valve**
9	**Lower body**
10	**Plug, pipe, 1/4–18**
11	**Unloader valve body**
12	**Spring**
13	**Spring button**

Figure 3–33. Unloader valve, exploded view.

(3) Remove the unloader valve body (11) from the lower body (9) by unscrewing it.

(4) Push the assembled piston and piston rod (3) down through the unloader valve body.

(5) Remove the piston (4) and piston packing (5) from the piston rod (3).

(6) Remove the body seat (6) and valve (8) from the lower body (9).

(7) Remove the gasket (7) from the body seat.

Note. Remove the gasket only if it needs to be replaced.

c. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry throughly.

(2) Inspect all parts for cracks, breaks, wear, or other damage. Replace a damaged part.

d. Reassembly.

(1) Install the gasket (7) on the body seat (6).

(2) Install the body seat (6) and valve (8) in the lower body (9).

(3) Install the piston (4) and piston packing (5) on the piston rod (3).

(4) Push the assembled piston and piston rod (3) up through the unloader valve body (11).

(5) Install the unloader valve body (11) on the lower body (9).

(6) Install the spring (12) and spring button (13) on the piston rod (3) and secure with the nut (1).

(7) Install the pipe plug (10) in the lower body (9).

e. Installation.

(1) Install the pipe nipple (32, fig. 3-30) in the unloader valve (34).

(2) Install the unloader valve (34) and pipe nipple (32) on the aftercooler manifold (30).

(3) Install the unloader valve (34) in the bushing (25).

(4) Connect the sensing tube (31) and tighten the compression nuts (29).

(5) Install the aftercooler tube (para 3-81).

f. Adjustment.

(1) Start the air compressor (para 2-26).

(2) Watch the pressure gage to see at what point the unloader valve opens. The unloader valve is adjusted correctly if it opens when the air pressure reaches 175 psi.

(3) If the unloader valve opens before the air pressure reaches 175 psi, turn the nut (35) clockwise until the unloader valve is operating correctly.

(4) If the unloader valve opens after the air pressure has gone over 175 psi, turn the nut counterclockwise until the unloader valve is operating correctly.

3-84. Aftercooler Manifold

a. Removal.

(1) Remove the unloader valve (para 3-83).

(2) Remove the aftercooler manifold (30, fig. 3-30) from the check valve (28).

(3) Remove the pipe plug from the aftercooler manifold.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, worn threads, rust, or other damage. Replace a damaged part.

c. Installation.

(1) Install the pipe plug in the aftercooler manifold.

(2) Install the aftercooler manifold (30) in the check valve (28).

(3) Install the unloader valve (para 3-83).

3-85. Check Valve

a. Removal.

(1) Remove the aftercooler manifold (para 3-84).

(2) Remove the check valve (28, fig. 3-30) from the pipe nipple (27) in the pipe tee (26) and remove the pipe nipple from the check valve. Remove the pipe tee (26) and nipple from the air receiver tank.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, worn threads, rust, or other damage. Replace a damaged part.

c. Installation.

(1) Install the nipple and pipe tee (26) in the air receiver tank.

(2) Install the pipe nipple (27) in the check valve (28) and install the assembled check valve on the pipe nipple (27) in the pipe tee (26).

(3) Install the aftercooler manifold (para 3-84).

3-86. Receiver Tank Safety Valve

a. Removal.

(1) Stop the engine (para 2-26).

(2) Release all air from the air receiver tank by opening the draincock.

(3) Remove the reciver tank safety valve (7, fig. 1-2) from the air receiver tank.

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect for cracks, breaks, rust, or damaged threads. Replace a damaged valve.

c. Installation. Install the receiver tank safety valve (7, fig. 1-2) in the air receiver tank.

3-87. Tire Gage, Hose Assembly, and Globe Valve

a. Removal.

(1) Stop the engine (para 2-27).

(2) Release all air from the air receiver tank by opening the draincock.

(3) Remove the tire gage from the hose assembly and remove the hose assembly from the bushing.

(4) Remove the globe valve from the pipe nipple and remove the bushing from the globe valve.

b. Cleaning and Inspection.

(1) Clean with a clean, dry cloth.

(2) Inspect the hose assembly for cracks, breaks, cuts, or damaged fittings. Replace if defective.

(3) Inspect the tire gage for breaks, defective fittings, or other damage. Replace if defective.

(4) Inspect all other parts for worn or broken threads, leaks, cracks, or other damage. Replace a damaged part.

c. Installation.

(1) Install the bushing in the globe valve and install the globe valve on the nipple.

(2) Install the hose assembly on the bushing and install the tire gage on the hose assembly.

3-88. Air Receiver Tank

a. Removal (Model OEG-458-ENG-1).

(1) Remove the engine (para 3-61).

(2) Remove the compressor (para 3-62).

(3) Remove the receiver tank safety valve (para 3-86).

(4) Remove the pressure gage (para 3-93).

(5) Remove the hose assembly and globe valve (para 3-87).

(6) Remove the check valve and fittings (para 3-85).

(7) Remove the draincock (4, fig. 1-4).

b. Removal (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Remove the receiver tank safety valve (para 3-86).

(2) Remove the hose assembly and globe valve (para 3-87).

(3) Remove the fuel tank (para 3-35).

(4) Disconnect the air receiver tank to air pressure gage tube and air compressor-to-air receiver tank tube from the air receiver tank (21, fig. 2-6).

(5) Remove the elbows, adapters, . and draincock from the air receiver tank.

(6) Remove the screws, lockwashers, and nuts that secure the air receiver tank to the base channel assembly (1, fig. 3-24) and remove the tank.

c. Cleaning, Inspection, Testing and Repair.

(1) Clean the interior and exterior of the tank with steam or an approved cleaning solvent and dry thoroughly.

(2) Inspect the tank for cracks, broken weld, dents, and corrosion. Inspect for damaged threads.

(3) Repair by welding all broken welds, cracks, breaks, or rust holes. Test the tank after welding as described in (4) below. Replace a tank that cannot be repaired.

(4) Perform a hydrostatic pressure test as follows:

(*a*) Install pipe plugs in all but one opening of the tank.

(*b*) Fill the tank with water.

(*c*) Install a fitting that is equipped with an air coupling and a pressure gage of at least 200 psi capacity in the opening in the tank. Put 200 psi air pressure into the tank and watch for leaks.

Caution: **Do not exceed 200 psi pressure in the tank.**

(*d*) Drain the water from the tank, remove the fitting and air coupling and thoroughly dry the tank.

d. Installation (Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3).

(1) Install the draincock (4, fig. 1-4).

(2) Install the check valve and fittings (para 3-85).

(3) Install the hose assembly and globe valve (para 3-87).

(4) Install the pressure gage (para 3-93).

(5) Install the receiver tank safety valve (para 3-86).

(6) Install the air compressor (para 3-62).

(7) Install the engine (para 3-61).

e. Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Position the air receiver tank (21, fig. 2-6) on the base channel assembly (1, fig. 3-24) and secure with the screws, lockwashers, and nuts.

(2) Install the draincock, adapters, and elbows on the air receiver tank.

(3) Connect the air receiver tank-to-air pressure gage tube and air compressor-to-air receiver tank tube to the air receiver tank.

(4) Install the fuel tank (para 3-35).

(5) Install the globe valve and hose assembly (para 3-87).

(6) Install the receiver tank safety valve (para 3-86).

3-89. Air Lines and Fittings

a. Removal (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Disconnect the tube (18, fig. 3-10) from the adapters and remove the tube.

(2) Disconnect tee-to-unloader valve tube (20) from the tee (17) and the unloader valve (11) and remove the tube.

(3) Remove the screws (14), lockwashers, and nuts that secure the pipe clamps (12) to the brackets (10) and remove the pipe clamps.

(4) Disconnect the aftercooler tube (6, fig. 3-9) from the adapter (5) and remove the nipple, valve, and fittings.

(5) Remove, in order, the elbow, bushing, bushing (19, fig. 3-10), tee (17), nipple (16), check valve (15), pipe nipple (13), elbow (4, fig. 3-9) and adapter (5).

(6) Remove the screws (9, fig. 3-10), lockwashers, and nuts that secure the brackets (10) to the base channel assembly (1, fig. 3-24) and remove the brackets.

(7) Remove the adapters, couplings, washers, and nipple from the louver end enclosure (24, fig. 3-24).

b. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent, and dry thoroughly.

(2) Inspect for cracks, damaged threads, and other damage. Replace all damaged parts.

c. Installation (Models BMW-452-ENG and BMW-452-ENG-1).

(1) Install the nipple, washers, couplings, and adapters in the louver end enclosure (24, fig. 3-24).

(2) Position the brackets (10, fig. 3-9) on the base channel assembly (1, fig. 3-24) and secure with the screws (9, fig. 3-10), lockwashers, and nuts.

(3) Install the adapter (5, fig. 3-9) on the elbow (4), then install, in order, nipple (13, fig. 3-10), check valve (15), nipple (16), tee (17), bushing (19), bushing and elbow.

(4) Install the nipple, valve, and fittings and connect the aftercooler tube (6, fig. 3-9) to the adapter (5).

(5) Position the pipe clamps (12, fig. 3-10) on the brackets (10) and secure with the screws (14), lockwashers, and nuts.

(6) Connect tee to-unloader valve tube (20) to the tee (17) and the unloader valve (11).

(7) Connect the tube (18) to the adapters.

3-90. Draincock

a. Removal (Models OEG-458-ENG-1 OEG-458-ENG-2, and OEG-458-ENG-3).

(1) Turn off engine.

(2) Release all air from compressor by opening draincock.

(3) Remove draincock (7, fig. 1-5) from air receiver tank (4).

b. Cleaning and Inspection (Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3).

(1) Clean draincock with an approved cleaning solvent and dry thoroughly.

(2) Inspect for corrision, cracks, and defective threads.

(3) Replace a defective draincock.

c. Installation (Models OEG-458-ENG-1, OEG-458-ENG-2, and OEG-458-ENG-3). Install draincock (7, fig. 1-5) in the air receiver tank (4).

Section XIII. CONTROLS AND INSTRUMENTS

3-91. General

The controls and instruments for operation of the models BMW-452-ENG and BMW-452-ENG-1 air compressors are mounted on the instrument panel located at the right front section of the unit. Refer to paragraphs 2-12 through 2-24 for a description of these components.

3-92. Controls and Instruments

a. Removal. Refer to figure 3-8 for the removal of the controls and instruments.

b. Cleaning and Inspection.

(1) Clean all parts with a cloth dampened with an approved cleaning solvent and dry thoroughly.

(2) Inspect the instruments for broken glass, loose terminals, and other damage.

(3) Inspect the controls for cracked knobs, kinked or broken cables, improper operation, and other damage.

(4) Inspect the switches for improper operation, damaged or corroded terminals, and other damage.

(5) Replace all damaged or defective parts.

c. Installation. Refer to figure 3-8 for the installation of the controls and instruments.

3-93. Pressure Gage

a. Removal.

(1) Stop the engine (para 2-27).

(2) Release all air from the air receiver tank by opening the draincock.

(3) Remove the pressure gage (6, fig 1-2) from the air receiver tank.

b. Cleaning and Inspection.

(1) Clean the pressure gage with a cloth dampened with an approved cleaning solvent. Dry with a clean, dry lint free cloth.

(2) Inspect the pressure gage for cracks, rust, broken glass, worn threads, or other damage. Replace a damaged pressure gage.

c. Installation. Install the pressure gage (6, fig. 1-2) in the air receiver tank.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope

a. These instructions are published for the direct and general support and depot maintenance personnel maintaining the air compressors. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations

b. Report all equipment improvement recommendations as prescribed by TM 38-750.

4-2. Record and Report Forms

For record and report forms applicable to field and depot maintenance, refer to TM 38-750.

Note. Applicable forms, excluding standard Form 46 which is carried by the operator, will be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

4-3. Description

A general description of the air compressors, the location and description of the identification and instruction plates, and information on the differences in models are contained in chapter 1 of this manual. The repair and maintenance instructions are described in appropriate sections of this chapter.

4-4. Tabulated Data

a. Table 1 lists the number of man-hours required for various operations in the maintenance and repair of the air compressors. The times listed are not intended to be rigid standards. Under adverse conditions, the operations will take longer; but under ideal conditions with highly skilled mechanics, most of the operations can be accomplished in considerably less time.

Table 1. Time Standards

	Man-hours
LUBRICATION AND SERVICE	
01 ENGINE	
0100 ENGINE ASSEMBLY	
Engine, gasoline (Drain and refill with new oil.)	0.3
03 FUEL SYSTEM	
0304 AIR CLEANER	
Cleaner assembly (clean and refill with new oil.)	0.1
0306 TANKS, LINES, FITTINGS	
Tank, fuel (Clean strainer and fill tank.)	0.2
0309 FUEL FILTER	
Filter assembly (Clean strainer.)	0.1
50 PNEUMATIC EQUIPMENT	
5000 AIR COMPRESSOR ASSEMBLY	
Compressor, air (Drain and refill base with lubricating oil.)	0.8
5008 AIR INTAKE	
Air cleaner (Clean element)	0.4
5014 AIR RECEIVER	
Tank, air (Drain moisture and blow down.)	0.2
REMOVE AND REPLACE	
01 ENGINE	
0100 ENGINE, ASSEMBLY	
Engine, gasoline (Includes removal and replacement of belts and guards.)	3.0

Table 1. Time Standards—Continued

Code	Item	Man-hours
01	ENGINE—Continued	
0101	CRANKCASE, BLOCK, CYLINDER HEADS	
	Block, engine (Engine removed.) (Includes removal and replacement of engine base, cylinder head, and internal parts.)	6.0
	Head, cylinder (Includes removal and replacement of cover.)	0.5
0102	CRANKSHAFT	
	Crankshaft (Engine removed.) (Includes removal and replacement of engine base, cylinder head, air shroud.)	3.5
	Bearings and seals (Engine and Pulleys removed.)	1.0
0103	FLYWHEEL ASSEMBLY	
	Flywheel (Includes removal and replacement of starting pulley and screen.)	0.5
0104	PISTONS, CONNECTING RODS	
	Pistons and rings (Includes removal and replacement of cylinder head and oil base.)	2.0
	Connecting rod (Includes removal and replacement of cylinder head and oil base.)	1.0
0105	VALVES, CAMSHAFTS AND TIMING SYSTEM	
	Valves and inserts (Includes removal and replacement of cylinder head, carburetor, and valve cover.)	3.0
	Guide, valve (Includes removal and replacement of cylinder head, carburetor, and valve.)	2.9
	Lifter, valve (Includes removal and replacement of camshaft.)	6.5
	Camshaft assembly (Includes removal and replacement of crankshaft and oil pump.)	2.6
	Gear, helical (Camshaft removed).	0.5
0106	ENGINE LUBRICATION SYSTEM	
	Body assembly, oil pump (Engine removed). (Includes removal and replacement of engine base.)	1.0
	Breather	0.1
01	ENGINE—Continued	
0107	ENGINE STARTING SYSTEM	
	Guard	0.2
	Pulley, starting	0.3
0108	MANIFOLDS	
	Manifolds, intake	0.3
03	FUEL SYSTEM	
0301	CARBURETOR	
	Carburetor	0.5
0302	FUEL PUMP	
	Pump, fuel	0.3
0304	AIR CLEANER	
	Air cleaner	0.1
	Bracket	0.2
0306	TANKS, LINES, FITTINGS	
	Tank assembly	0.3
	Bracket (Includes removal and replacement of cylinder head air shroud model OEG-458-ENG-1 only.)	0.3
0308	ENGINE SPEED GOVERNOR AND CONTROLS	
	Governor, flyweight (Includes removal and replacement of engine, crankshaft, and camshaft.)	6.0
	Control assembly	0.4
0309	FUEL FILTERS	
	Filter assembly	0.3
04	EXHAUST SYSTEM	
0401	MUFFLER AND PIPES	
	Muffler	0.3
	Raincap and seal	0.3
05	COOLING SYSTEM	
0502	COWLING, DEFLECTORS, AIR DUCTS, SHROUD	
	Shroud, air (Includes removal and installation of covers, screens, and starting pulleys.)	1.0
06	ELECTRICAL SYSTEM	
0601	GENERATOR	
	Generator, battery charging (Includes removal and installation of belts and guards model BMW-452-ENG and BMW-ENG-1 only.)	0.5
0602	GENERATOR REGULATOR	
	Regulator voltage (Model BMW-452-ENG and BMW-452-ENG-1 only.)	0.2
0603	STARTING SYSTEM	
	Starter, engine	0.3
0605	IGNITION COMPONENTS	
	Magneto assembly (Includes retiming engine.)	0.5

Table 1. Time Standards—Continued

		Man-hours
06	ELECTRICAL SYSTEM—Continued	
	Kit, repair	1.0
	Sparkplug	0.1
	Cable ignition	0.2
0606	ENGINE SAFETY CONTROLS	
	Switch hi-temperature	0.2
0607	CONTROL PANEL	
	Gage, fuel	0.2
	Ammeter	0.2
	Hourmeter	0.2
	Switch, start-stop (Model BMW-452-ENG and BMW-452-ENG only.)	0.1
0615	RADIO INTERFERENCE SUPPRESSION	
	Capacitor	0.1
	Strap, ground	0.1
15	FRAME	
1501	FRAME ASSEMBLY	
	Frame (Includes removal and replacement of motor and compressor winterization enclosure, air receiver) (Model BMW-452-ENG and BMW-452-ENG-1 only.)	3.0
22	MISCELLANEOUS BODY, CHASSIS OR HULL AND ACCESSORY ITEMS	
2207	WINTERIZATION EQUIPMENT	
	Enclosure, winterization	1.5
47	GAGES	
4702	GAGES, MOUNTINGS, LINES AND FITTINGS	
	Gage pressure	0.2
50	PNEUMATIC EQUIPMENT	
5000	AIR COMPRESSOR ASSEMBLY	
	Compressor, air (Model OEG-458-ENG-1) (Includes removal and replacement of beltguard.)	1.0
	Compressor, air (Model BMW-452-ENG and BMW-452-ENG-1) (Includes removal and replacement of winterization enclosure.)	2.0
5001	CRANKCASE, BLOCK, CYLINDERHEAD	
	Crankcase, compressor (Compressor removed—includes removal and replacement of cylinders, flywheel, crankshaft.)	3.5
	Cover plate, access (each)	0.3
	Cylinder, air	2.5
5002	CRANKSHAFT	
	Crankshaft (Includes removal and replacement of cylinder, end plate, connecting rods, and bearings.)	4.5
50	PNEUMATIC EQUIPMENT—Continued	
	Seal, oil (Includes removal and replacement of flywheel.)	1.0
5003	FLYWHEEL	
	Flywheel	0.5
5004	PISTONS, CONNECTING RODS	
	Piston, compressor (Includes removal and replacement of cylinder, connecting rods, piston rings.)	4.0
	Ring, piston (Piston removed from compressor).	0.5
	Connecting rod (Piston removed from compressor.)	0.5
5005	VALVES	
	Valve assembly	2.0
5006	LUBRICATION SYSTEM	
	Tube, breather	0.4
5007	COMPRESSOR DRIVE	
	Flywheel	0.6
	Belts	0.5
	Guards	0.2
5008	AIR INTAKE	
	Manifold, intake	0.3
	Air cleaner	0.2
5009	UNLOADER SYSTEM COMPONENTS	
	Centrifugal unloader	1.0
	Safety valve	0.5
	Check valve	0.5
5010	COMPRESSOR COOLING	
	Tube, intercooler and aftercooler (Includes removal and replacement of beltguard, belts and flywheel.)	1.0
5014	AIR RECEIVER	
	Air receiver (Includes removal and replacement of engine and compressor) (Model OEG-458-ENG-1.)	2.0
	Air receiver (Includes removal and replacement of fuel tank.) (Model BMW-452-ENG and BMW-452-ENG-1.)	1.0
5015	AIR DISCHARGE SYSTEM	
	Glove valve	0.2
	Hose, air	0.2
	Gage, tire pressure	0.1
	Manifolds	0.5

b. Table 2 lists manufacturer's sizes, tolerances, desired clearances, and maximum allowable wear and clearances for the gasoline engine.

c. Table 3 lists manufacturer's sizes, tolerances, and maximum allowable wear and tolerances for the air compressor.

Table 2. Engine Repair and Replacement Standards

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max	
Cylinder:					
Cylinder bore	2.9995	3.0005	- - -	- - -	0.003
Cylinder taper	- - -	0.0005	- - -	- - -	- - -
Cylinder out of round	- - -	0.0005	- - -	- - -	- - -
Crankshaft:					
Journal length	1.126	1.126	- - -	- - -	0.002
Journal diameter	1.125	1.126	- - -	- - -	0.002
Journal taper	- - -	0.0005	- - -	- - -	- - -
Journal out of round	- - -	0.0005	- - -	- - -	- - -
Runout, flywheel end	- - -	0.007	- - -	- - -	- - -
Eng play	0.001	0.003 (Engine cold)	- - -	- - -	- - -
Journal shoulder fillet radius	0.125	- - -	- - -	- - -	- - -
Piston and pin:					
Piston diameter	2.9960	2.9970	- - -	- - -	0.0005
Piston pin diameter	0.7497	0.7500	- - -	- - -	0.001
Piston rings:					
End gap (when fitted in cylinder)	- - -	- - -	0.012	0.022	- - -
To groove (total both sides):					
Compression ring	- - -	- - -	0.002	0.0035	- - -
Two compression and scraper rings	- - -	- - -	0.001	0.0025	- - -
Oil ring	- - -	- - -	0.0025	0.004	- - -
Spark:					
Advance (ahead of top dead center)	- - -	20°	- - -	- - -	- - -
Connecting Rod Bearing:					
Rod bearing inside diameter	1.12670	1.12700	- - -	- - -	0.003
Rod bearing-to-crankshaft journal clearance	0.0007	0.002	- - -	- - -	- - -
Connecting Rod Sleeve Bearing:					
Inside diameter	0.75050	0.75080	- - -	- - -	0.0005
Connecting Rod Bearing:					
End play	- - -	- - -	0.004	0.010	- - -
Valves, Valve Guides, and Valve Lifters:					
Valve stem diameter	0.3080	0.3090	- - -	- - -	0.002
Valve guide inside diameter	0.3120	0.3130	- - -	- - -	0.002
Lifter diameter	0.6230	0.6240	- - -	- - -	0.002
Lifter clearance in guide	- - -	- - -	0.001	0.0025	- - -
Camshaft:					
Camshaft support pin diameter	0.4900	0.4905	- - -	- - -	0.002
Camshaft and gear inside diameter	0.4920	0.4930	- - -	- - -	0.002
Oil Pump:					
Plunger-to-bore	0.003	0.004	- - -	- - -	- - -

Table 3. Compressor Repair and Replacement Standards

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max	
Cylinders:					
Bore, low-pressure	4.625	4.626	0.002	0.003	0.006
Bore, high-pressure	2.500	2.5005	– – –	– – –	0.006
Taper	0.001	0.001	– – –	– – –	– – –
Out-of-round	0.001	0.001	– – –	– – –	0.002
Crankshaft:					
Journal size, main bearing	1.376	1.377	– – –	– – –	– – –
Journal size, connecting rod	1.375	1.376	– – –	– – –	– – –
Journal out-of-round	– – –	0.0005	– – –	– – –	– – –
Journal taper	– – –	0.0002	– – –	– – –	– – –
Piston, piston pins, and piston rings:					
Piston size, low-pressure	4.6195	4.6200	– – –	– – –	0.0015
Piston size, high-pressure	2.4970	2.4975	– – –	– – –	0.0015
Piston pin diameter, low-pressure	0.93750	0.93775	– – –	– – –	0.001
Piston pin diameter, high-pressure	0.93750	0.93775	– – –	– – –	0.001
Piston pin length, high-pressure	2.118	2.123	– – –	– – –	– – –
Piston pin length, low-pressure	4.250	4.250	– – –	– – –	– – –
Piston pin clearance in piston	– – –	– – –	0.0002	0.0009	– – –
Piston to cylinder clearance, low-pressure	– – –	– – –	0.00050	0.0055	– – –
Piston to cylinder clearance, high-pressure	– – –	– – –	0.0025	0.0030	– – –
Piston ring side clearance, low-pressure	– – –	– – –	0.0010	0.0025	– – –
Piston ring side clearance, high-pressure	– – –	– – –	0.0010	0.0045	– – –
Piston ring gap, low-pressure	0.013	0.023	– – –	– – –	– – –
Piston ring gap, high-pressure	0.007	0.017	– – –	– – –	– – –
Connecting rods and bearings:					
Bearing running clearance	– – –	– – –	0.0003	0.0016	– – –
Bearing side clearance	– – –	– – –	0.0040	0.0012	– – –
Bearing internal diameter	1.355	1.357	– – –	– – –	– – –

Section III. SPECIAL TOOLS AND EQUIPMENT

4-5. Special Tools and Equipment

No special tools or equipment are required to perform field and depot maintenance on the air compressors.

4-6. Direct and General Support and Depot Maintenance Repair Parts

Direct and general support and depot maintenance repair parts are listed and illustrated in TM 5-4310-227-25P.

4-7. Specially Designed Tools and Equipment

No specially designed tools or equipment are required to perform direct and general support and depot maintenance on the air compressors.

Section IV. TROUBLESHOOTING

4-8. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure to the air compressors or any of their components. Each trouble symptom stated is followed by a list of probable causes of trouble. The possible remedy recommended is described opposite the probable cause.

4-9. Engine Hard To Start or Fails To Start

Probable cause	Possible remedy
Valves sticking or valve seat inserts defective	Clean valve or grind valve seats (para 4-25).
Valves warped or burned	Replace valves (para 4-25).
Magneto defective	Repair magneto (para 4-19).
Fuel pump defective	Repair fuel pump (para 4-29).

4-10. Engine Misses or Runs Erratically

Probable cause	Possible remedy
Magneto defective	Repair magneto (para 4-19).
Valves burned, warped, or broken	Grind or replace valves (para 4-25).
Governor defective	Repair governor (para 4-34).
Compression poor	Replace valves (para 4-25). Replace piston and/or piston rings (para 4-31).

4-11. Engine Stops Suddenly

Probable cause	Possible remedy
Magneto defective	Repair magneto (para 4-19).
Engine seizure	Drain oil from engine base and examine drained oil for presence of metal particles. If the engine has been operating with insufficient oil, inspect for possible damage such as scored piston, scored cylinder walls, burned or damaged connecting rod, bent connecting rod, or broken piston pin (para 4-31).

4-12. Engine Lacks Power

Probable cause	Possible remedy
Governor defective	Repair governor (para 4-34).
Compression poor	Grind or replace valves (para 4-25).
Piston and/or piston rings defective	Replace piston and/or piston rings (para 4-31).

4-13. Engine Noisy

Probable cause	Possible remedy
Piston pin loose	Replace piston pin (para 4-31).
Piston worn or damaged	Replace piston (para 4-31).
Connecting rod worn	Replace connecting rod (para 4-31).

4-14. Engine Backfires

Probable cause	Possible remedy
Intake valve defective	Replace intake valve (para 4-25).

4-15. Compressor Noisy

Probable cause	Possible remedy
Piston pin bearing worn	Replace worn bearing (para 4-38).
Connecting rod bearing worn	Replace worn bearing (para 4-38).

4-16. Compressor Fails To Build Up Pressure

Probable cause	Possible remedy
Pistons or piston rings worn	Replace pistons or piston rings (para 4-38).
Cylinder bore out-of-round	Replace cylinder (para 4-38).

4-17. Compressed Air Contains Oil

Probable cause	Possible remedy
Pistons or piston rings worn out	Replace pistons or piston rings (para 4-38).
Cylinder bore out-of-round	Replace cylinder (para 4-38).

Section V. ENGINE ELECTRICAL SYSTEM

4-18. General

The main function of the magneto is to supply high-voltage current for the engine electrical system. The magneto consists of the contact set, capacitor, coil, magnetic rotor, and impulse coupling The contact set, which provides a timed spark for ignition, is actuated by the magnetic rotor. The impulse coupling is used to provide an intense spark for starting the engine. Models BMW-452-ENG and BMW-452-ENG-1 have an electric starter and generator. Refer to TM 5-2805-203-14 for data applicable to model OEG-458-ENG-3.

4-19. Magneto Assembly

a. Removal and Disassembly.

(1) Remove the magneto (para 3-46).

(2) Remove the ignition shield (para 3-46).

(3) Remove the breaker arm terminal screw (11, fig. 3-13) and lockwasher (10) and remove the capacitor lead (9), coil lead, and breaker arm and spring (15) from the contact set support plate (2).

(4) Remove the fulcrum retaining ring (17) and remove the breaker arm and spring (15) from the fulcrum pin (16). Remove the breaker arm flat wick (12) from the breaker arm.

(5) Remove the two locking screws (8 and 13), lockwashers (10), and flat washers (14 and 7) that secure the contact set support plate (2) to the bearing support plate assembly (1). Remove the cam wick and holder assembly (6) and contact set support plate from the magneto

(6) Remove the screw (5) that secures the capacitor (4) and the bearing support plate and remove the capacitor.

(7) Remove the knurled nut (22, fig. 4-1) that secures the ground switch pushbutton (21) in the ignition shield (16) and remove the ground switch assembly.

(8) Remove the ground switch retaining ring (18) from the pushbutton (21) and separate the bushing (19) spring (20), and pushbutton.

(9) Remove the two setscrews (45) that secure the magneto coil (1) in the magneto frame (44) and remove the coil. Remove the screw (3) that secures the coil clip (2) to the coil and remove the clip.

(10) Remove the 4 screws (25) that secure the bearing support plate assembly (26) in the frame (44) and remove the support plate assembly. Remove the 2 shims (29) from the rotor shaft. Use a suitable press and remove the rotor sleeve bearing (24) from the bearing support plate.

(11) Remove the sleeve nut (32) on the rotor (27).

(12) Remove the sleeve bearing (33) from the rotor shaft.

(13) Use a pair of pliers and grasp one of the drive lugs on the coupling shell (35); turn the coupling shell clockwise and slowly pull outward at the same time. Pull the coupling shell just far enough so that a screwdriver can be inserted behind the coupling shell to remove the drive spring (36) from its anchor slot in the coupling shell. Remove the coupling shell from the rotor.

(14) Remove the coupling hub assembly (37) from the rotor. Lift the drive spring (36) and the torsion spring (38) from the coupling hub.

(15) Remove the woodruff key (28) from the keyway in the rotor shaft.

(16) Remove the outer end flat washer (39), plain seal (40), and inner end flat washer (41) from the rotor.

(17) Remove the retaining ring (42) from the rotor.

(18) Use a suitable press and remove the rotor from the annular ball bearing (31) inside the magneto frame (44).

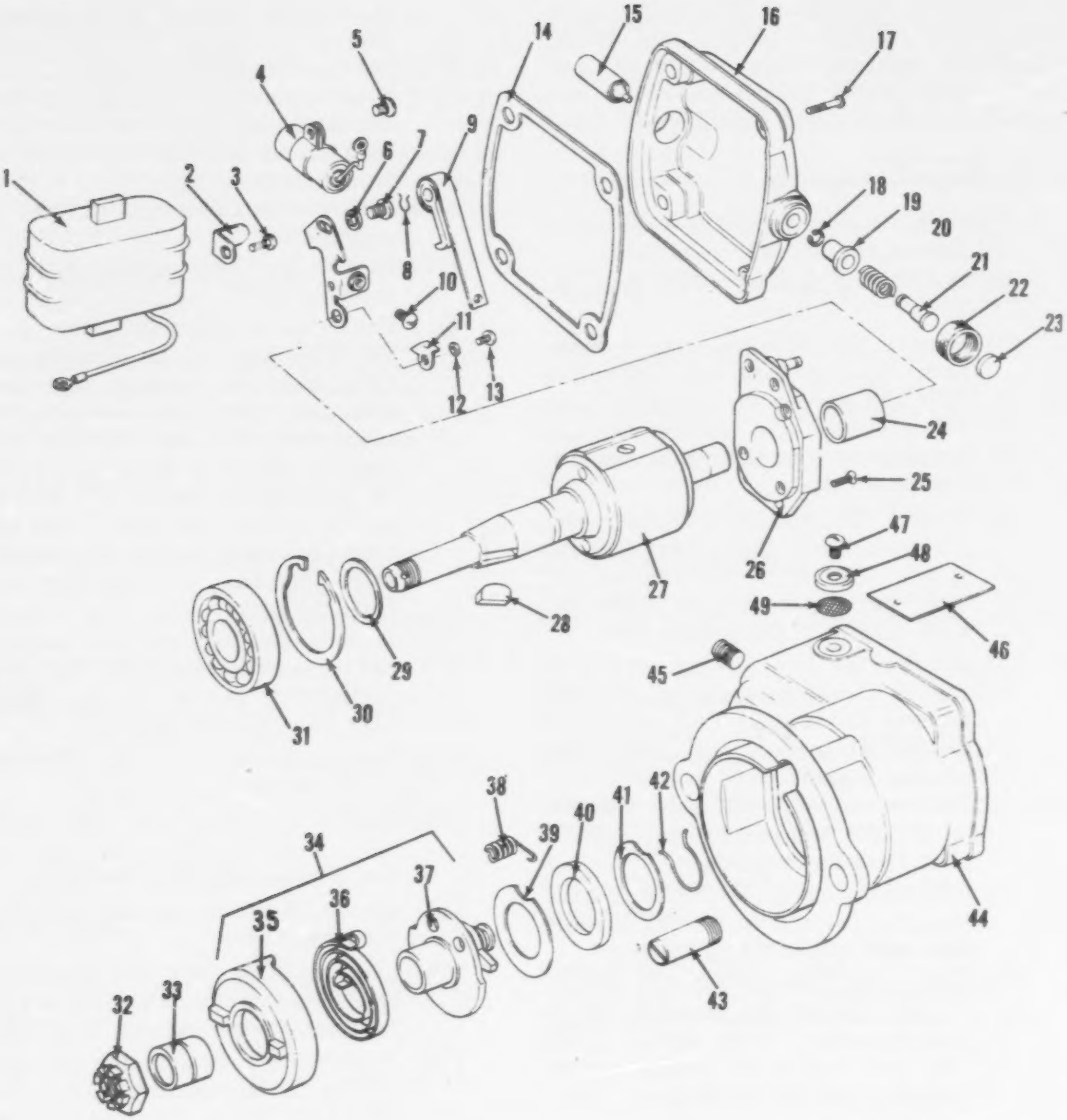
(19) Remove the retaining ring (30) that secures the ball bearing (31) in place inside the frame and press the ball bearing out of the frame.

(20) Remove the pawl stop pin (43) from the threaded hole inside the frame.

(21) Remove the two vent assemblies (para 3-46).

b. Cleaning, Inspection and Repair.

(1) Clean all metal parts in an approved cleaning solvent and blow them dry with compressed air.



MSC 4310-227-15/39

1 Magneto coil
2 Coil clip
3 Screw, mach. No. 6-32 X 3/16 inch
4 Capacitor
5 Screw, mach. No. 8-32 X 1/4 inch
6 Washer, flat, brass, 9/64 inch id X 9/32 inch od X 1/64 inch thk
7 Screw, mach. No. 6-32 X 3/8 inch (2 rqr)
8 Fulcrum retaining ring
9 Breaker arm and spring
10 Screw, mach. No. 6-32 X 3/8 inch (2 rqr)
11 Cam wich holder
12 Washer, flat, 5/32 inch id X 3/8 inch od, X 0.049 inch thk
13 Screw, mach. No. 8-32 X 3/8 inch
14 End cap gasket

Figure 4-1. Magneto, exploded view.

15	Cable outlet
16	Ignition shield
17	Screw, end cap
18	Ground switch retaining ring
19	Bushing
20	Spring
21	Pushbutton
22	Knurled nut
23	Ground switch button
24	Sleeve bearing
25	Screw, mach. No. 8-32 × 3/8 inch
26	Bearing support plate assembly
27	Magnetic rotor
28	Key, woodruff, No. 3
29	Shim (2 rqr)
30	Retaining ring
31	Annular ball bearing
32	Sleeve nut
33	Sleeve bearing
34	Coupling hub assembly
35	Coupling shell
36	Drive spring
37	Hub assembly
38	Torsion spring
39	Washer, flat, outer end, 5/8 inch id, 1 3/8 inch od, 1/32 inch thk
40	Plain seal
41	Washer, flat, inner end, 23/32 inch id, 1 17/64 inch od, 0.015 in. thk
42	Retaining ring
43	Pawl stop pin
44	Magneto frame
45	Setscrew, headless, 1/4-20 × 7/8 inch (2 rqr)
46	Name plate
47	Screw, vent cover
48	Cover, vent
49	Screen, vent

Callouts For Figure 4-1—Continued.

(2) Inspect the coil for cracked or broken insulation. Use a coil tester and test for shorts and leaks.

(3) Inspect the annualar ball bearing for wear and roughness when rotated. Noisy operation and metal chips in the races are indications of damage.

(4) Inspect the magneto frame and bearing support plate for breaks and cracks.

(5) Inspect the rotor sleeve bearings for wear, pitting, burning and scoring.

(6) Inspect the rotor for wear, pitting, cracks, and breaks.

(7) Inspect all springs for corrosion, distortion, and wear.

(8) Inspect the coupling hub and shell for cracks, breaks, and wear.

(9) Inspect the drive gear for broken, cracked, or shipped teeth.

(10) Inspect the fit of the seal on the rotor shaft. The seal must fit snugly.

(11) Inspect all threaded parts for signs of defective threads.

(12) Repair or replace damaged and defective parts as necessary.

c. Reassembly and Installation.

(1) Install the two vent assemblies (para 3-46).

(2) Install the pawl stop pin (43) in the frame (44).

(3) Position the annular ball bearing (31) inside the frame with the unsealed face toward the drive gear end, and install the retaining ring (30).

(4) Install the magnetic rotor (27) in the frame and on the ball bearing.

(5) Install the retaining ring (42) on the rotor.

(6) Install the inner end flat washer (41), plain seal (40), and outer end flat washer (39) on the rotor.

(7) Position the woodruff key (28) in the rotor shaft keyway.

(8) Install the torsion spring (38) on the coupling hub assembly (37) and press the coupling hub on the rotor. Engage the outer end of the drive spring (36) with the slot in the coupling shell (35) and wind the drive spring until it is compressed sufficiently to fit inside the coupling shell.

(9) Aline the coupling shell and drive spring with the hub assembly (37) on the rotor. Lift the inner torque of the drive spring just enough to engage it with the anchoring slot in the coupling hub and secure the spring in the slot.

(10) Hold the coupling shell firmly; turn the rotor to wind up the drive spring (36) until the impulse coupling hub and shell can be pressed together. Install the sleeve bearing (33) on the shaft of the rotor (27).

(11) Hold the magneto upright, in the normal position and rotate the impulse coupling clockwise until the pawl on the coupling hub engages the pawl stop pin (43). The two drive lugs on the coupling shell (35) should now be in a vertical position.

(12) Install the sleeve nut (32) on the rotor.

(13) Position the 2 shims (29) on the rotor and install the rotor sleeve bearing (24) in the bearing support plate assembly (26). Secure the support plate to the frame with the 4 screws (25).

(14) Secure the coil slip (2) to the magneto coil (1) with the screw (3). Secure the coil in the frame (44) by installing the setscrews (45).

(15) Secure the capacitor (4) to the bearing support plate assembly (26) with the screw (5).

(16) Install the cam wich holder (11) on the contact set support plate and secure the contact set support plate to the bearing support plate assembly (26) with the two screws (10 and 13), and flat washers (6 and 12)

(17) Position the breaker arm and spring (9) on the fulcrum pin in the bearing support plate assembly (26). Install the fulcrum retaining ring (8) on the fulcrum pin.

(18) Secure the breaker arm and spring (9), coil lead, and capacitor lead to the contact set support plate with the terminal screw (10).

(19) Position the spring (20) on the pushbutton (21) and position the pushbutton in the bushing (19). Secure by installing the ground switch retaining ring (18) on the pushbutton.

(20) Position the ground switch assembly in the ignition shield (16) and secure with the knurled nut (22).

(21) Adjust the contact set gap (para 3-46).

(22) Install the ignition shield (para 3-46).

(23) Install the magneto (para 3-46).

4-20. Starter (Mode. BMW-452-ENG)

a. Removal and Installation. Remove and install the starter assembly (para 3-51).

b. Disassembly. Disassemble starter in numerical sequence of parts as illustrated in figure 4-2. Due to the method of installing field coils and other components in the frame and field or fungus resistant assemblies, it is necessary to replace the frame and field assembly as a unit, if field coils are required.

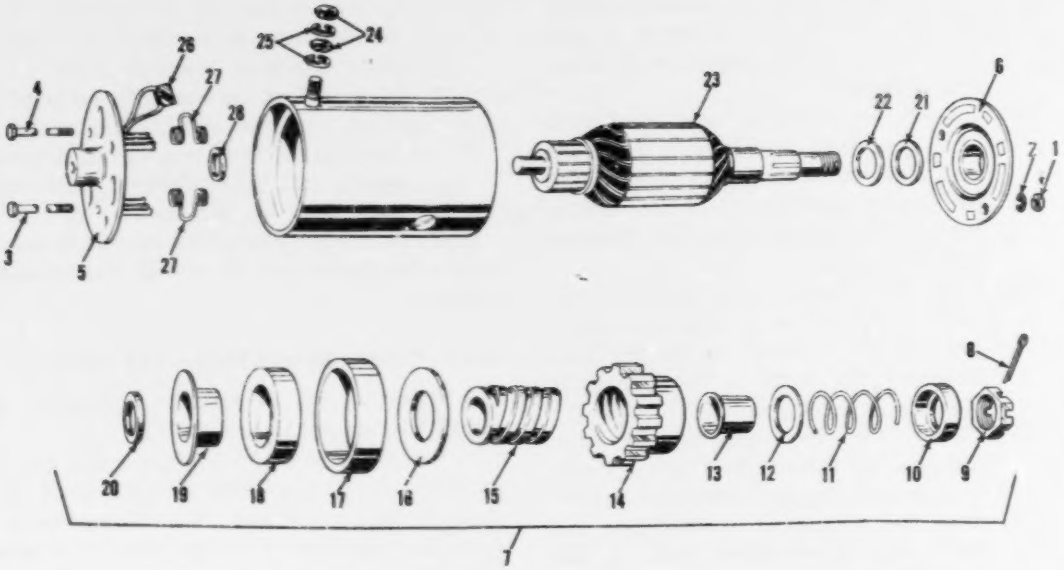
c. Cleaning, Inspection, Testing and Repair.

(1) Clean all metal parts except the drive assembly in an approved cleaning solvent and dry thoroughly.

(2) Clean the armature with a clean cloth dampened with an approved cleaning solvent and dry with low pressure, compressed air. Inspect the comutator for rough spots, scoring, pitting, burned, or out of-round condition. If the commutator is worn, burned, or rough, place the armature in a lathe and take light cuts on the commutator until the condition is corrected. Undercut the mica to a depth of 1/32 to 3/64 inch. Smooth the commutator with No. 00 sandpaper and blow off particles with low-pressure, compressed air.

(3) Use a growler to test the armature for a short winding. Position the armature on the growler and energize the growler. Hold a thin, steel strip parallel to the core slots and explore the exposed surface of the armature core. A short - circuited coil in one of the slots, bridged by the jaws of the growler, will cause the steel strip to vibrate when brought close to the other slot occupied by the defective coil. Turn the armature in the growler one slot at a time and continue to explore with the steel strip until all coils have been tested. Replace a defective armature.

***Caution:* In the following open the ground tests, do not touch the test probes to the shaft bearing surfaces or the commutator brush surfaces.**



MSC 4310-227-15/40

1	Nut
2	Washer, lock
3	Bolt
4	Bolt
5	Commutator and head assembly
6	Drive end head assembly
7	Drive assembly
8	Pin, cotter
9	Nut
10	Pinion stop
11	Spring
12	Pinion washer
13	Sleeve
14	Pinion
15	Shaft
16	Washer, thrust
17	Cup, cushion
18	Cushion
19	Washer, thrust cup
20	Spacer
21	Washer, thrust
22	Washer, thrust
23	Armature
24	Nut
25	Washer, lock
26	Brush
27	Spring
28	Washer, thrust

Figure 4-2. Starter, exploded view (Model BMW-452-ENG).

(4) Test the armature for open circuits with a growler. Position the armature on the growler and energize the growler. With the test probes connected to an AC voltmeter, select a pair of commutator bars which give a readable indication on the voltmeter. Maintaining this relation between the test probe position, the growler, turn the armature one slot at a time until all coils are tested. The voltmeter readings should be nearly uniform. If the armature has been proven free of shorts (see (3) above), a low or zero reading indicates an open circuit. Replace a defective armature.

(5) Test the armature for grounds with a test lamp circuit. Test Between the armature shaft or core and one of the commutator bars. Repeat the test at two or more locations around the commutator to preclude the possibility of testing from an isolated bar. If the lamps light, the armature is grounded. Replace a defective armature.

(6) Inspect the field windings housing, endbell, drive housing, and pole shoes for cracks, breaks, or other damage. Replace as necessary.

(7) Inspect all hardware for cracks, breaks, or damaged threads. Replace defective parts.

(8) Inspect the electrical contact brushes for cracks, breaks, or excessive wear. Replace the brushes if worn to one-half their original length or if otherwise defective.

(9) Inspect the electrical leads for breaks or frayed condition. Inspect the brush and field connecting lead for breaks or frayed condition and for brittle, broken or cracked insulation. Replace defective parts.

(10) Clean the starter drive with a clean cloth dampened in an approved cleaning solvent. Inspect the starter drive assembly for worn or broken parts. Replace if defective.

(11) Inspect the sleeve bearings for scoring, breaks, warped condition, or other damage. Replace defective parts.

(12) Test the assembled commutator end head and brushholders with a test lamp circuit. Test between the brushholders mounted on the insulated hinge pins and the end head. If the lamp lights, a grounded condition exits and the defective insulated hinge pins or insulated stop pins must be replaced. Test the brush springs for proper tension. Minimum tension in 42 ounces.

(13) Clean the field windings with a clean cloth dampened in an approved cleaning solvent and dry thoroughly. Inspect the soldered connections for a loose, broken, or corroded condition. Resolder defective connections.

(14) Test the field windings for an open circuit with a test lamp circuit. Test between the terminal stud and each lead of the field windings. If the lamp fails to light on any of the above tests, an open circuit is indicated and the defective field windings must be replaced.

(15) Test the field windings for grounds with a test lamp circuit. Test between the terminal stud and the field windings housing. If the lamp lights, a grounded condition exists. Break the electrical connections and test between the terminal stud and the field windings housing. If the lamp lights, a ground exists and the defective washers between the terminal stud and the field windings housing must be replaced. Test between the leads of the field windings and the field windings housing. If the lamp lights, a ground exists and the defective field windings must be replaced.

d. Reassembly. Reassemble starter in accordance with figure 4-2 reversing the numerical sequence.

4-21. Starter (Model BMW-452-ENG-1)

a. Removal and Installation. Remove and install the starter (para 3-51).

b. Disassembly. Refer to figure 4-3 and disassemble the starter. Due to the method of installing field coils and other components in the frame and field of fungus resistance assemblies, it is necessary to replace the frame and field assembly as a unit if field coils are required.

c. Cleaning, Inspection, Testing and Repair. Refer to paragraph 4-20c for cleaning, inspection, testing, and repair. The proper minimum brush spring tension for the 24-volt starter is 42 ounces.

d. Reassembly. Refer to figure 4-3, and reassemble the starter.

4-22. Generator (Model BMW-452-ENG)

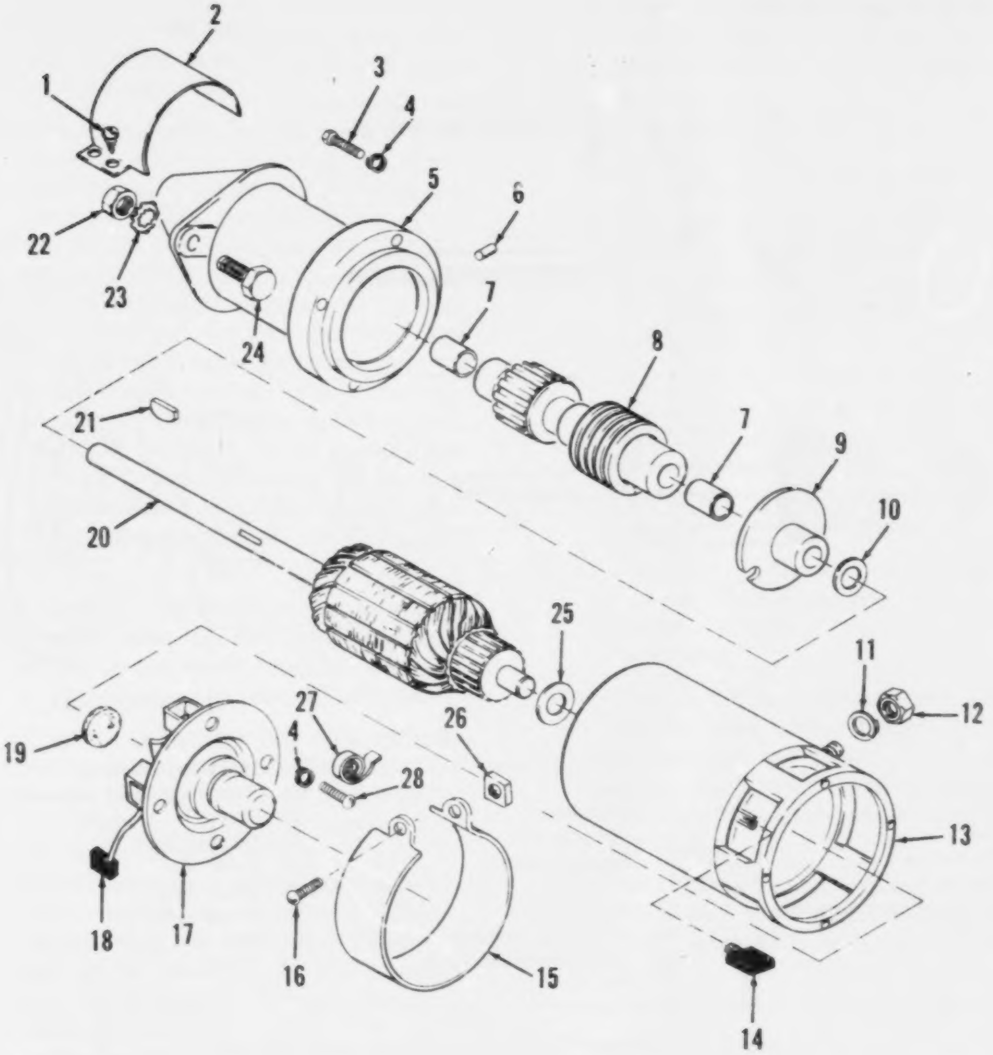
a. Removal and Installation. Remove the install the generator assembly (para 3-49).

b. Disassembly. Disassemble the generator in numerical sequence of parts as illustrated in figure 4-4. Because of the method of installing field coils and other components in the frame and field of fungus resistant assemblies, it is necessary to replace the frame and field assembly, if field coils are required.

c. Cleaning, Inspection, Testing, and Repair.

(1) Clean all metal parts, except the ball bearings, with an approved cleaning solvent and dry thoroughly.

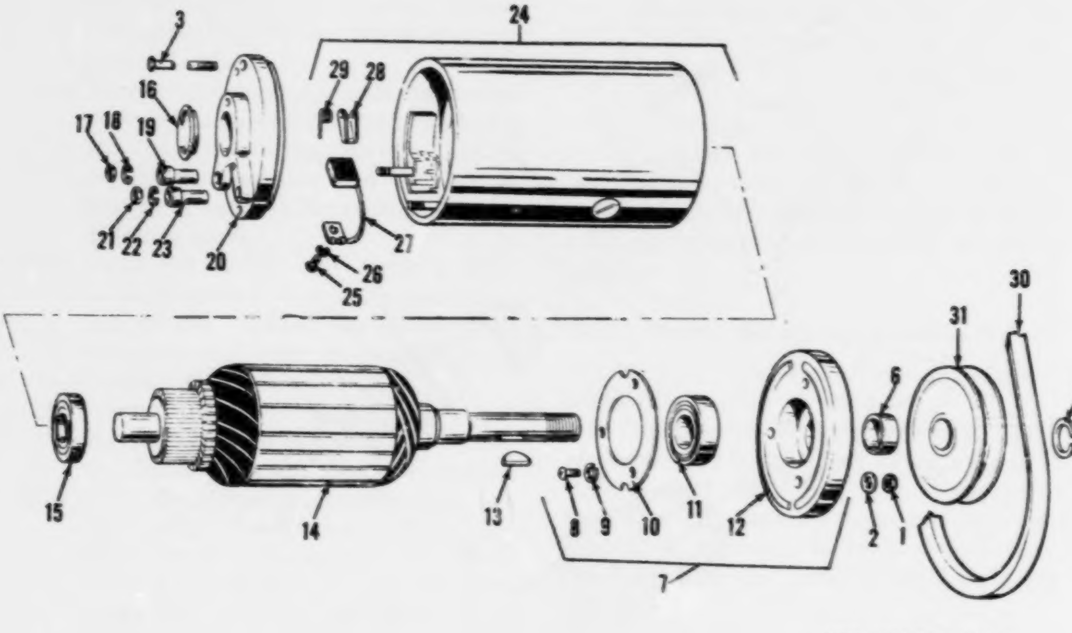
(2) Inspect all hardware for breaks, cracks, or damaged threads; replace if defective.



MSC 4310-227-15/40.1

1	Screw
2	Cover
3	Screw
4	Washer
5	Housing assembly
6	Pin
7	Bearing
8	Drive
9	Bearing
10	Washer
11	Washer
12	Nut
13	Stator
14	Brush set
15	Cover band
16	Screw
17	Endbell
18	Brush
19	Wick
20	Armature
21	Key
22	Nut
23	Washer
24	Screw
25	Washer
26	Nut
27	Spring
28	Screw

Figure 4-3. Starter, exploded view (Model BMW-452-ENG-1)



MSC 4310-227-15/41

1	Nut
2	Washer
3	Bolt
4	Nut
5	Washer, lock
6	Spacer
7	Drive end head assembly
8	Screw
9	Washer, lock
10	Bearing retainer
11	Bearing
12	Drive end head
13	Key
14	Armature
15	Bearing, ball
16	Bearing cover
17	Nut
18	Washer
19	Insulating bushing
20	Commutator end head
21	Nut
22	Washer
23	Insulating bushing
24	Frame and field assembly
25	Screw
26	Washer, lock
27	Brush set
28	Brush arm
29	Brush spring
30	Belt
31	Pulley

Figure 4-4. Generator, exploded view (Model BMW-452-ENG).

(3) Inspect the drive end frame and the field winding frame for cracks or breaks. Replace if defective.

(4) Inspect the ball bearings for free rotation. Replace if defective.

(5) Inspect the brushes for cracks, chips, or breaks. Replace brushes if worn to one-half their original length of seven-eights inch.

(6) Inspect the brush springs for proper tension or distortion. Minimum spring tension is 28 ounces. Replace a weakened or distorted brush spring.

(7) Inspect the bearing retainer for cracks, breaks, or excessive wear. Replace if defective.

(8) Clean the armature with a clean cloth dampened with an approved cleaning solvent and dry with low-pressure, compressed air. Inspect the commutator for rough spots, scoring, pitting, burned, or out-of-round condition. If the commutator is worn, burned, or rough, place the armature in a lathe and take light cuts on the commutator until the condition is corrected. Undercut the mica to a depth of 1/32 to

3/64 inch. Smooth the commutator with NO. 00 sandpaper and blow off particles with low-pressure, compressed air.

(9) Use a growler to test the armature for a short winding. Position the armature on the growler and energize the growler. Hold a thin, steel strip parallel to the core slots and explore the exposed surface of the armature core. A short-circuited coil in one of the slots, bridged by the jaws of the growler, will cause the steel strip to vibrate when brought close to the other slot occupied by the defective coil. Turn the armature in the growler one slot at a time, continue to explore with the steel strip until all coils have been tester. Replace a defective armature.

***Caution:* In the following open and ground tests, do not touch the test probes to the shaft bearings surfaces or the commutator brush surfaces.**

(10) Test the armature for open circuits with a growler. Position the armature on the growler and energize the growler. With the test probes connected to an AC voltmeter, select a pair of commutator bars which give a readable indication on the voltmeter. Maintaining this relation between the test probe position and the growler, turn the armature one slot at a time until all coils are tested. The voltmeter readings should be nearly uniform. If the armature has been proved free of shorts (see above), a low of zero reading indicates an open circuit. Replace a defective armature.

(11) Test the armature for grounds with a test lamp circuit. Test between the armature shaft or core and one of the commutator bars. Repeat the test at two or more locations around the commutator to preclude the possibility of testing from an isolated bar. If the lamps light, the armature is grounded. Replace a defective armature.

(12) Clean the field windings with a clean cloth dampened with an approved cleaning solvent and dry thoroughly.

(13) Test the field windings for an open circuit with a test lamp circuit. Test across the interconnection between the coils of the field windings. If the lamp fails to light, resolder the interconnection. Test between the two leads of the field windings. Failure of the lamp to light indicates an open circuit replaced.

(14) Test the field winding for a grounded circuit. Test between a lead of the field windings and the field windings frame. If the lamp lights, a grounded condition exists and the defective field winding must be replaced.

(15) Clean the commutator end head with a clean cloth dampened with an approved cleaning solvent and dry thoroughly.

(16) Using a test lamp circuit, test between the insulated brush holder and the commutator end head. If the lamp lights, the brush holder is grounded and the commutator end head must be replaced.

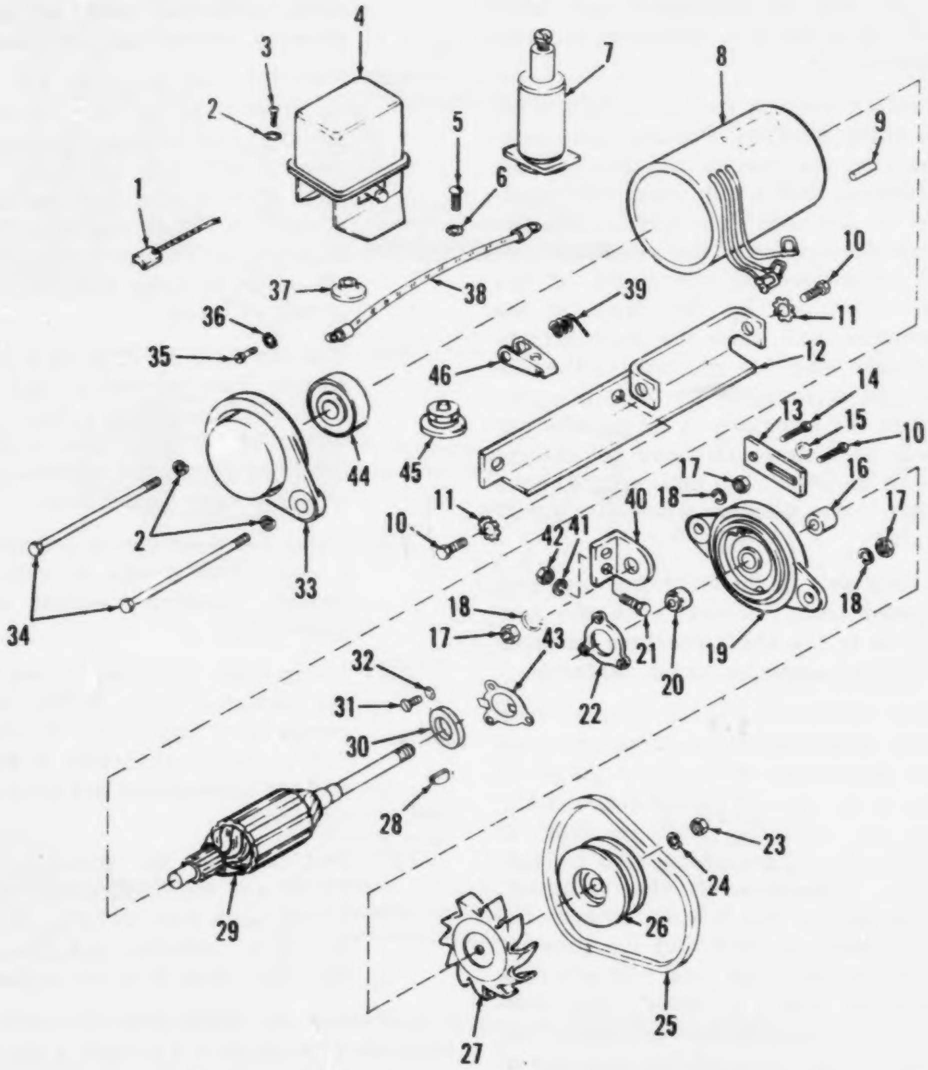
(17) Test between the grounded brushholder and the commutator end head. If the lamp fails to light, the brushholder is defective and the commutator end head must be replaced.

d. Reassembly. Reassemble generator in accordance with figure 4-4 reversing the numerical sequence.

4-23. Generator (Model BMW-452-ENG-1)

a. Removal and Installation. Remove and install the generator (para 3-49).

b. Disassembly. Refer to figure 4-5, and disassemble the generator. Due to the method of installing field coils and other components in the frame and field of fungus resistant assemblies, it is necessary to replace the frame and field assembly as a unit, if field coils are required.



MSC 4310-227-15/41.1

1	Brush set	13	Strap	25	Belt	37	Grommet
2	Washer	14	Screw	26	Sheave	38	Lead
3	Screw	15	Washer	27	Fan	39	Spring
4	Regulator	16	Spacer	28	Key	40	Bracket
5	Screw	17	Nut	29	Armature assembly	41	Washer
6	Washer	18	Washer	30	Ring	42	Nut
7	Condenser	19	Head	31	Screw	43	Plate
8	Field assembly	20	Bearing	32	Washer	44	Bearing
9	Pin	21	Screw	33	Head assembly	45	Rectifier
10	Screw	22	Retainer	34	Bolt	46	Arm
11	Washer	23	Locknut	35	Screw		
12	Bracket	24	Washer	36	Washer		

Figure 4-5. Generator, exploded view.

c. Cleaning, Inspection, Testing and Repair. Refer to paragraph 4-22 (*c*) for cleaning, inspection, testing, and repair. The proper minimum brush spring tension for 24-volt generator is 16 ounces.

d. Reassembly. Refer to figure 4-5, and reassemble the generator.

Section VI. ENGINE VALVES, VALVE GUIDES, AND SEAT INSERTS

4-24. General

The valve system of this engine consists of one intake and one exhaust valve. Both valves are spring-loaded and equipped with rotators to lessen the frequency of valve repair. The valves are accessible by removing the cylinder head and valve chamber cover. Both valves operate in valve guides pressed into the engine block. The valves and valve seat inserts are made of stellite resist burning. The function of the intake valve is to admit the fuel air mixture to the combustion chamber while the exhaust valve controls the release of the exhaust gases from the combustion chamber. Refer to TM 5-2805-203-14 for data applicable to model OEG-458-ENG-3.

4-25. Valves, Valve Guides, and Valve Seat Inserts

a. Removal.

(1) Remove the cylinder head (para 3-70).

(2) Remove the valve chamber access cover (para 3-69).

(3) Using a valve spring compressor tool, compress the valve spring (22, fig. 4-6). See that the tool is properly seated and located; then remove the two spring retainer locks (20) from the recess in the stem of the valve (1).

(4) Remove the spring compressor tool and lift the valve (1) out through the top of the cylinder and crankcase assembly (4).

(5) Remove the valve rotator (21) and valve spring (22) from the valve chamber.

(6) Remove the other valve and related components in a manner similar to that described in (3) through (5) above.

Note. The intake valve and the exhaust valve are stellitetype valves; each is equipped with a valve rotator. Be sure to identify the valves as they are removed, because each valve must be reinstalled in the same valve guide from which it was removed.

b. Cleaning, Inspection, and Repair.

(1) Scrape and/or wire brush carbon from the head and stem of the valves and from the inside of the installed valve guides.

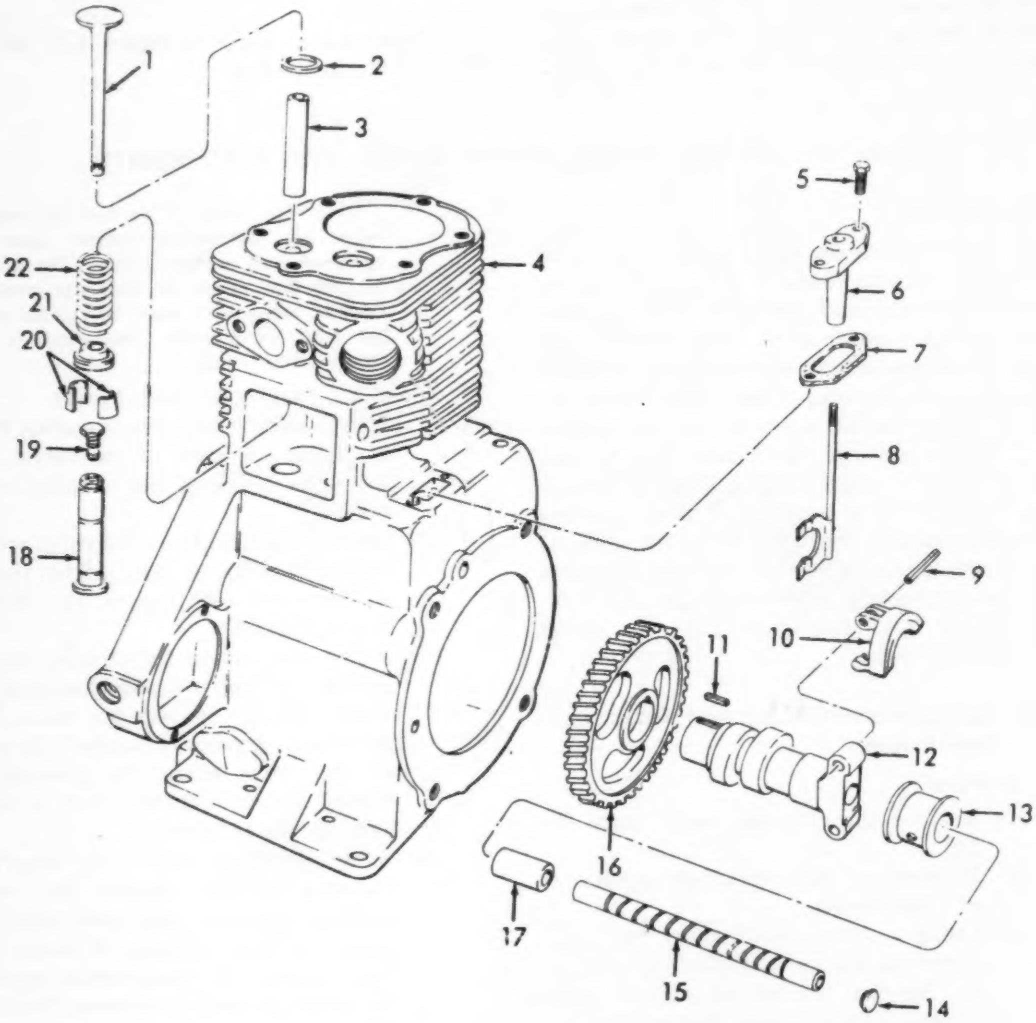
(2) Remove varnish from the valve stems. Carefully clean all carbon from the installed valve seat inserts (2) with a fine wire brush.

(3) Inspect the valves for evidence of imperfect seating, warpage, burning, or wear and also inspect the valve face for pits and grooves. Inspect the ends of the valve stems for grooves or scores. Reface slightly worn or damaged valves (*f* below).

(4) After cleaning with an approved cleaning solvent, inspect the valve springs, retainer locks, and valve rotators for wear or signs of metal failure. Inspect the compression springs for pressure and squareness. See that the valve rotators turn freely.

(5) Inspect the valve stem clearance of each valve in its respective valve guide. If the valve stem-to-guide clearance is excessive, either the valve stem or the valve guide is worn. Replace a valve guide having an inside diameter which measures in excess of 0.3130 inch (*c* below). Maximum allowable wear for the valves and valve guides is 0.002 inch.

(6) Measure the valve stem diameter. They should be replaced if the stem diameter is less than 0.3080 inch.



MSC 4310-227-15/42

1	Valve (2 rqr)	12	Camshaft
2	Valve seat insrt (2 rqr)	13	Sleeve bearing
3	Valve stem guide (2 rqr)	14	Expansion plug (2 rqr)
4	Cylinder and crankcase assembly	15	Camshaft support pin
5	Screw, cap, hex-hd, 1/4-20 × 3/4 in. (2 rqr)	16	Camshaft gear
6	Support bracket	17	Governor spacer
7	Governor yoke gasket	18	Valve lifter (2 rqr)
8	Governor yoke	19	Adjusting screw (spec) (2 rqr)
9	Spring pin (2 rqr)	20	Spring retainer lock (4 rqr)
10	Governor flyweight (2 rqr)	21	Valve rotator (2 rqr)
22	Key, woodruff, No. 3	22	Valve spring (2 rqr)

Figure 4-6. Valve, camshaft, and governor, exploded view.

Measure the valve face runout (*f* below).

(7) Inspect the valve seat inserts for evidence of burning, pitting, or cracking. Regrind slightly pitted or worn valve seat inserts (*e* below). Replace unserviceable valve seat inserts (*d* below).

(8) Inspect the adjusting screws (19) for wear and for fit in the installed valve lifters (18). Be sure the adjusting screws seat lightly in the valve lifters.

(9) Replace all removed parts applicable to the valve system that have become worn, defective, or damaged. Refer to paragraph 3-69 for valve-lifter removal and installation instructions.

c. Valve Guide Replacement. The valve stem guides (3) are pressed into place and must be removed if worn or defective.

(1) To remove a guide, first press the guide halfway into the valve chamber with a rod or punch slightly smaller than the outside diameter of the valve guide.

(2) Using a punch or rod and hammer, carefully break off the lower half of the valve guide in the valve chamber. Remove the broken lower half and press the remaining upper half of the valve guide out of the valve guide bore.

(3) Press the new valve guide into place. Do not burr or damage the ends of the valve guide.

d. Valve Seat Insert Replacement.

(1) Using a valve seat insert removing tool, remove the valve seat insert (2) from the cylinder and crankcase assembly (4).

(2) Clean all carbon and dirt from around the mounting recess for the valve seat insert.

(3) Position an expansion pilot guide in the valve stem guide (3).

(4) Chill a new valve seat insert; then position the insert on the cylinder and crankcase assembly (4). Set a valve seat insert driving tool over the expansion pilot guide and drive the valve seat firmly into the mounting recess.

(5) Grind the new valve seat insert lightly (*e* below).

Note. Always install the same type of valve seat insert that was removed.

e. Grinding Valve Seat Inserts. Slightly rough, pitted, burned, or new valve seat inserts should be reground. In most cases the inserts are worn or pitted very little and require only light refacing. Grind the valve seat angle to a ture angle of 45°. Remove only enough stock to clean up pits or grooves. If a new valve seat insert has been installed, as directed in *d* above, it must be refaced. Always mark a clean and even new seat when grinding valve seat inserts.

f. Refacing Valves. Measure the valve face runout with a dial indicator. If the runout is excessive, grind the valve face at a 45° angle on a precision valve grinder. Follow the instructions for grinding furnished with the valve grinder. Grind off only enough stock to remove pits and grooves or to remedy excessive runout. If the edge of the valve head is excessively thin after grinding or if runout persists, replace, the valve.

g. Valve Grinding. After refacing valves and valve seat inserts (*e* and *f* above) lightly tap the valves into the valve seat inserts with a medium grade grinding compound as follows:

(1) Apply a light and even amount of grinding compound around the valve face and lightly lubricate the valve stem with oil.

(2) Position the valve in its respective valve guide in the cylinder and crankcase block.

(3) Using a valve grinding tool, press down lightly on the valve head and at the same time rotate the valve repeatedly in both directions on the valve seat insert. Then remove the valve and observe the ring left by the grinding compound on the valve face and the valve seat insert. A valve which is properly seated will have a ring completely around the valve face.

Caution: **Do not over grind the valves.**

(4) Grind the other valve in a similar manner. After both valves have been fully seated, wipe off all excess grinding compound.

h. Installation.

(1) Position a valve spring (22) and valve rotator (21) in the valve chamber.

(2) Install a valve (1) in its respective valve stem guide (3) in the cylinder and crankcase assembly (4) and down through the valve spring and valve rotator.

(3) Using a valve spring compressor tool positioned under the valve rotator, compress the valve spring until the valve stem end is through the valve rotator far enough that the two retainer locks (20) can be installed in the recess at the end of the valve stem.

Note. Apply a small amount of clean grease to the inside of each retainer lock so that the locks will stick in position on the valve stem as the valve spring compressor tool is removed.

(4) Slowly release the valve spring compressor tool and remove it from the cylinder and crankcase assembly (4).

(5) Install the other valve (1) and related components in a manner similar to that described in (1) through (4) above.

(6) Adjust the valves (para 3-69).

(7) Install the valve chamber access cover (para 3-69).

(8) Install the cylinder head (para 3-70).

Section VII. ENGINE BASE, OIL PUMP, FUEL PUMP

4-26. General

a. Engine Base. The engine base supports the engine and forms the bottom of the crankcase. The base holds the engine lubricating oil. It is provided with an engine mounting boss at each of the four corners and is fastened to the crankcase by a series of capscrews and lockwashers. Gasket paper between the base and the lower part of the crankcase provides a seal to prevent oil from leaking out of the crankcase.

b. Oil Pump. The oil pump is a plunger-type unit, mounted on the lower inside of the cylinder and crankcase assembly. It is operated by a cam-actuated plunger rod. The pump draws oil from the engine base and sprays it on the internal working components of the engine.

c. Fuel Pump. Compressors, models BMW-452-ENG and BMW-452-ENG-1 have a fuel pump mounted on the engine as shown in figure 4-7.

4-27. Engine Base

a. Removal.

(1) Remove the crankcase drain plug and drain the oil from the engine.

(2) Remove the engine (para 3-61).

(3) Remove the 12 capscrews (19, fig. 2-7) and lockwashers that secure the engine base (21) to the cylinder and crankcase assembly (18). Remove the engine base and the engine base paper gasket (20).

b. Cleaning, Inspection, and Repair.

(1) Clean the engine base and all applicable parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the engine base for cracks, breaks, or other damage. Inspect for metal burrs around the base mounting flange on the engine.

(3) Inspect all applicable threaded parts for damaged threads.

(4) Remove all metal burrs which might tend to affect the mounting of the engine base on the engine. Replace a faulty engine base paper gasket. Replace an engine base damaged beyond repair.

c. Installation.

(1) Position the engine base paper gasket (20) and the engine base (21) on the cylinder and crankcase assembly (18) and secure with the 12 lockwashers

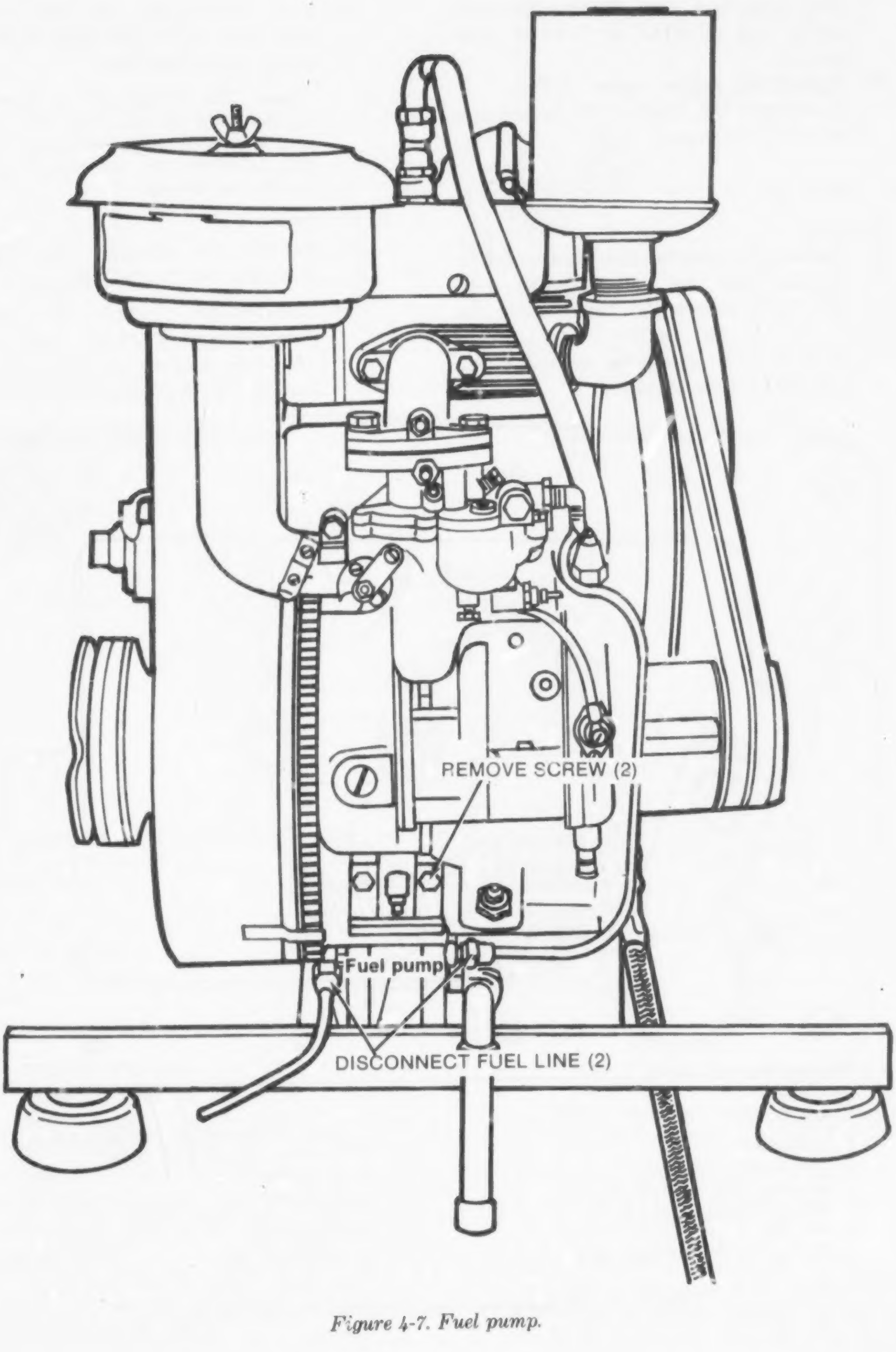


Figure 4-7. Fuel pump.

and capscrews (19). Torque the capscrews to a value of 7 to 9 foot-pounds.

(2) Install the engine (para 3-61).

(3) Lubricate the engine in accordance with the lubrication order.

4-28. Oil Pump

a. Removal.

(1) Remove the engine base (para 4-27).

(2) Remove the two bolts (8, fig. 4-8) and lockwashers (9) that secure the oil pump (10) in the lower part of cylinder and crankcase assembly (7) and remove the oil pump.

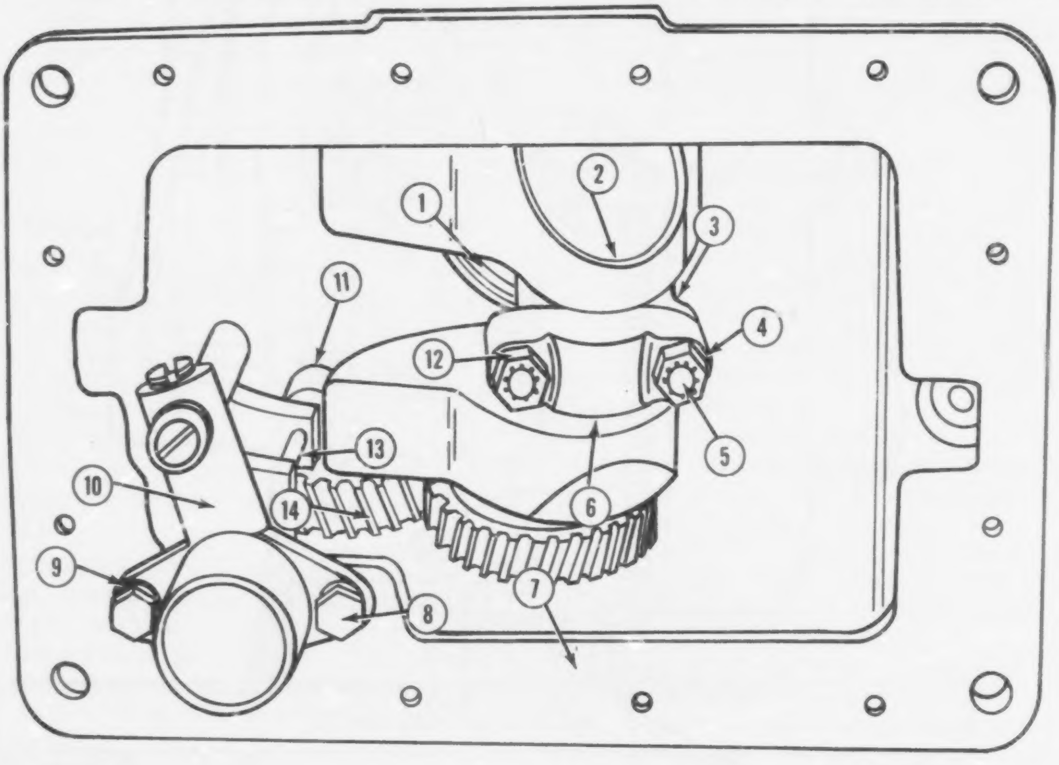
(3) Free the plunger pin (13) from the push rod cap (11) and remove the plunger pin and cap.

Note. The plunger pin is seated firmly in the base of the cap and will not drop out unless excessively worn. A slight pull downward on the plunger pin will free it from the cap.

b. Disassembly.

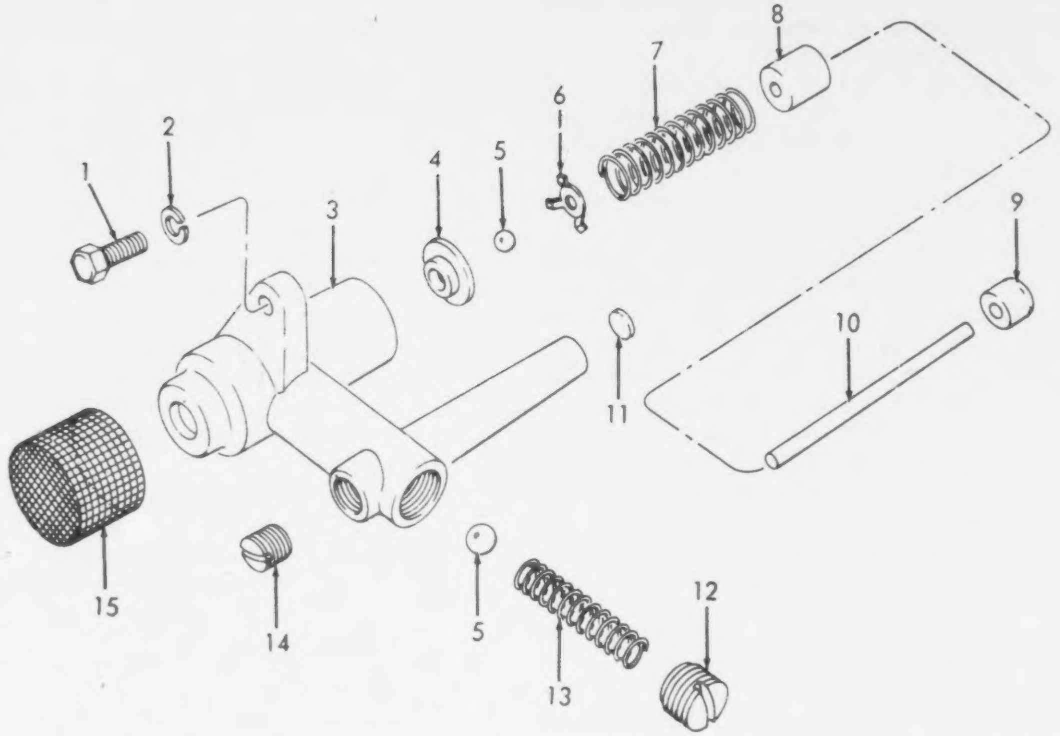
(1) Remove the strainer (15, fig. 4-9) from the oil pump body (3).

(2) Remove the plunger (8), compression spring (7), check ball retainer (6), and bearing ball (5) from the bore in the top of the oil pump body.



1 Piston
2 Crankshaft
3 Connecting rod
4 Nut, stamped, 5/16-24 (2 rqr)
5 Bolt, shoulder (spec) (2 rqr)
6 Rod cap
7 Cylinder and crankcase assy.
8 Bolt, mach. hex-hd. 1/4-20 x 5/8 in. (2 rqr)
9 Washer, lock, 1/4 in. (2 rqr)
10 Oil pump
11 Push rod cap
12 Nut, hex, 5/16-24 (2 rqr)
13 Plunger pin
14 Camshaft gear

Figure 4-8. Oil pump and connecting rod, removal points.



MSC 4310-227-15/45

1	Bolt, mach. hex-hd, 1/4-20 × 5/8 in. (2 rqr)	9	Push rod cap
2	Washer, lock, 1/4 in. (2 rqr)	10	Plunger pin
3	Oil pump body	11	Expansion plug
4	Ball seat	12	Plug, pipe, 1/4-18
5	Bearing ball, 5/16 in. dia. (2 rqr)	13	Compression spring
6	Check ball retainer	14	Plug, pipe, 1/8-27
7	Compression spring	15	Strainer
8	Plunger		

Figure 4-9. Oil pump, exploded view.

(3) Remove the pipe plug (12) from the threaded hole in the side of the oil pump body; then remove the outlet compression spring (13) and bearing ball (5) from the same hole.

(4) Remove the pipe plug (14) from the threaded hole in the bottom of the oil pump body.

(5) Using a suitable arbor press, remove the ball seat (4) from the seat bore in the oil pump body.

Note. Inspect the condition of the bearing ball seat prior to removal. Do not remove the seat unless it is damaged or worn (*c* (3) below).

(6) Remove the expansion plug (11) from the top of the outlet spray nozzle on the oil pump body (3).

Note. This plug should not be removed unless damaged or if the outlet spray nozzle is excessively clogged and cannot be properly cleaned with the plug installed.

c. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for cracks, breaks, and signs of wear.

(3) Inspect the ball seat at the bottom of the seat bore for cracks, breaks, and worn condition. Replace a defective ball seat (*b* (5) above).

(4) Inspect the bearing balls for roughness and corrosion.

(5) Apply a light film of engine oil to the plunger; then insert the plunger into position in the oil pump body and measure the clearance between the plunger and the plunger bore. The normal clearance should measure between 0.003 and 0.004 inch. Replace the plunger if the clearance is excessive. Replace the oil pump body if worn.

(6) Inspect all applicable threaded components for damaged threads.

(7) Replace all defective oil pump parts.

(8) Inspect the plunger pin and cap for cracks, breaks, and signs of wear.

(9) Position the plunger pin in the two bored mounting flanges inside the cylinder and crankcase assembly. Be sure the plunger pin moves freely and does not bind.

(10) Examine the fit of the cap on the plunger pin. The cap should set firmly on the plunger pin.

(11) Replace a defective or excessively worn plunger pin or cap.

d. Reassembly and Testing.

(1) Install the expansion plug (11) in the top of the spray nozzle on the oil pump body (3). Carefully make several small notches around the edge of the plug with a sharp pointed punch to secure the plug in position.

(2) Using an arbor press, install the ball seat (4) in the seat bore in the oil pump body.

(3) Position the bearing ball (5) in the bore inside the oil pump body. Insert the outlet compression spring (13) into the same hole and secure with the pipe plug (12).

(4) Position the other bearing ball (5) in the bore in the top of the oil pump body, then install the check ball retainer (6), the compression spring (7), and the plunger (8).

(5) Position the strainer (15) on the bottom of the oil pump body.

(6) After the oil pump has been assembled, and prior to installing it in the cylinder and crankcase block, inspect the pumping efficiency of the oil pump. Set the lower half of the oil pump in a container of clean engine oil. Push the plunger down repeatedly until a steady stream of oil sprays from the hole in the side of the spray nozzel. This indicates that the oil pump is functioning properly.

e. Installation.

(1) Position the plunger pin (10) in the rod bores in the two mounting flanges inside the engine crankcase.

(2) Install the push rod cap (9) firmly on the top of the camshaft end of the plunger pin.

(3) Set the oil pump in the mounting position in the bottom of the cylinder and crankcase assembly and secure with the two lockwashers (2) and bolts (1).

(4) Install the engine base (para. 4-27).

4-29. Fuel Pump

a. Removal. Remove fuel pump (para 3-41).

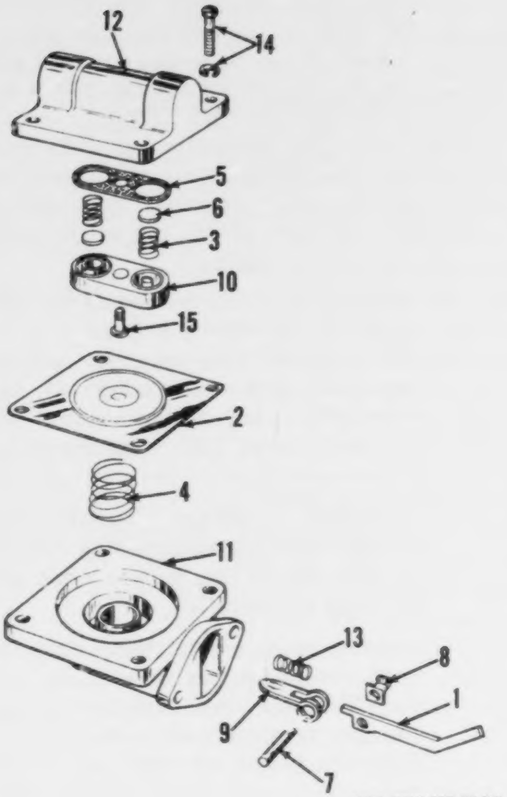
b. Disassembly.

(1) To facilitate proper reassembly of the head (12, fig. 4-10) onto the mounting bracket (11), scribe-mark the inlet and outlet sides of the head.

(2) Remove the screw and lockwasher assemblies (14) and remove the head (12).

(3) Turn head over. Remove the screw (15) that secures the valve assemblies (3, 5, 6, and 10) in the head (12), note the location of each part, and remove the valve plate and seats (10), springs (3), valves (6), and valve gasket (5). Discard springs (3), valves (6), and valve gasket (5).

(4) Remove rocker arm spring (13).



MSC 4310-227-15/46

1 Rocker arm
2 Diaphragm
3 Valve spring
4 Diaphragm spring
5 Valve gasket
6 Valve
7 Rocker arm pin
8 Spring clip
9 Linkage
10 Valve plate and seats
11 Mounting bracket
12 Head
13 Rocker arm spring
14 Screw and lockwasher assembly
15 Valve plate screw and lockwasher

Figure 4-10. Fuel pump, exploded view.

(5) Hold the mounting bracket (11) in the left hand, with the rocker arm (1) toward the body, and the thumb nail on the end of the linkage (9). With the heel of the right hand on the diaphragm (2), compress diaphragm spring (4) and at the same time turn the diaphragm clockwise 90°. This will unhook the diaphragm from linkage (9). Discard spring (4) and diaphragm (2).

c. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all parts for breaks, cracks, and signs of wear.

(3) Replace all defective parts.

d. Reassembly.

(1) Install the new valve spring (3) and valve (6) in their proper position in the head (12). Install a new gasket (5) and the valve plate and seats (10) and secure with screw (15).

(2) Install a new spring (4) in the mounting bracket (11).

(3) Install the new diaphragm (2), reversing the procedure in (*b* (5) above).

(4) Install rocker arm spring (13).

(5) Install the partially assembled fuel pump on the engine (para 3-41).

(6) Slowly crank the engine until the diaphragm (2) is laying flat on the mounting bracket (11). Place the head (12) in its proper position on the mounting bracket (11) and install the screw and lockwasher assemblies (14) approximately three turns.

(7) Slowly crank the engine until the diaphragm (2) is pulled down into mounting bracket (11) and tighten the screw and lockwasher assemblies (14).

e. Installation. Install the fuel line (para 3-41).

Section VIII. ENGINE PISTON AND CONNECTING ROD ASSEMBLY

4-30. General

The piston is an aluminum alloy, four-ring piston. The piston has two compression rings, a scraper ring, and an oil control ring. The piston pin is of hollow steel and is held in place with a retaining ring at each end. The connecting rod is fitted with a sleeve bearing for the piston pin. The fit of the connecting rod on the crankshaft is governed by shims between the connecting rod and the rod cap. Refer to TM 5-2805-203-14, for data applicable to model OEG-458-ENG-3.

4-31. Piston and Connecting Rod Assembly

a. Removal and Disassembly.

(1) Remove the engine base (para 4-27).

(2) Remove the cylinder head (para 3-70).

Note. Before removing the piston and connecting rod assembly, remove any carbon deposits and/or wear ridge from the upper end of the cylinder bore.

(3) Turn the crankshaft (2, fig. 4-8) until the piston (1) reaches the lowest position of travel in the cylinder bore, then place a cloth on the piston head to collect the cuttings when the ridge is removed.

(4) Position a ridge cutter at the top of the cylinder bore, according to instructions furnished with the cutter, and remove any ridges present.

Caution: **If the ridge is heavy, do not attempt to remove it all in one cut. Take several small cuts, if necessary, to remove a heavy ridge.**

(5) After the ridge has been removed, remove the ridge cutter from the top of the cylinder bore. Then turn the crankshaft until the piston reaches the top of its stroke and carefully lift out the cloth with the cuttings.

(6) Again turn the crankshaft assembly until the piston is at the bottom of its stroke. Remove the 2 stamped nuts (4) and hex nuts (12) from the 2 shoulder bolts (5) that secure the connecting rod (3) to the crankshaft (2).

(7) The connecting rod and the rod cap (6) are both marked with an arrow for assembly purposes. However, make matching punch marks on each to insure correct installation; then remove the rod cap and the two shims (29, fig. 4-11) from the connecting rod (13).

Note. It may be necessary to tap lightly on the sides of the rod cap with a soft metal hammer to loosen the cap.

(8) Loosen the connecting rod (13) from the crankshaft (15); then push the piston and connecting rod upward and out through the top of the cylinder bore as a unit.

(9) Remove the two shoulder bolts (28) from the connecting rod.

(10) Use a piston ring expander and remove the compression ring (8), two compression and scraper rings (9), and the oil ring (10) from the piston (11).

Caution: **Always position the chrome-faced top compression ring in the first piston ring groove when piston rings are installed.**

(11) Remove the two retaining rings (12) from the piston pin bore in the piston. Then use a soft metal rod or piston pin remover and a hammer to drive the piston pin (26) out of the piston (11) and sleeve bearing (27) in the connecting rod (13). Separate the piston and connecting rod.

Note. If the piston pin fit is exceptionally tight in the piston pin bore, use an arbor press to remove the pin from the piston.

(12) Use an arbor press to press the sleeve bearing (27) from the end of the connecting rod (13).

Note. The sleeve bearing should not be removed unless inspection indicates it is worn or defective (*b* (9) below).

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Remove the carbon deposits from the piston. Clean the piston ring grooves with a ring groove cleaner. Be sure the oil ring holes are clean.

(3) Inspect the piston for cracks and breaks at the skirt, pin bosses, and

ring grooves. Inspect for a scuffed or scored condition around the skirt.

(4) Inspect the piston rings for damage and end gap. Measure the end gap with the piston ring compressed in the cylinder bore and parallel to the top of the machined surface of the cylinder and crankcase block. Replace damaged piston ring or a ring having an end gap greater than 0.022 inch. Measure the end gap of replacement rings in a similar manner and file the ends, if necessary, to obtain a minimum gap of 0.012 inch. Using a new piston as a gage, measure the side clearance between each of the piston rings and their respective piston grooves. Proper side clearance is compression ring, 0.002 to 0.0035 inch; compression and scraper rings, 0.001 to 0.0025 inch; oil ring, 0.0025 to 0.004 inch. Replace the complete ring set if any one ring does not meet its specified side clearance.

(5) Replace a piston showing signs of excessive skirt clearance on ring side clearance, cracks, breaks, or other damage. Measure the diameter of the piston. Replace the piston if the diameter is less than 2.9960 inches.

(6) Replace a piston pin showing signs of fracture or wear. Measure the diameter of the piston pin. Replace a piston pin if the diameter is less than 0.7497 inch.

(7) Inspect the connecting rod and rod cap for cracks and breaks. Inspect the bearing seating surfaces for nicks, burrs, and scratches. Repair or replace the connecting rod as necessary.

(8) Inspect the shoulder bolts and nuts for cracks, breaks, and damaged threads. Replace faulty shoulder bolts or nuts.

(9) Inspect the sleeve bearing for scoring, scratches, and wear. Measure the inside diameter of the sleeve bearing. Replace a sleeve bearing having an inside diameter larger than 0.75080 inch.

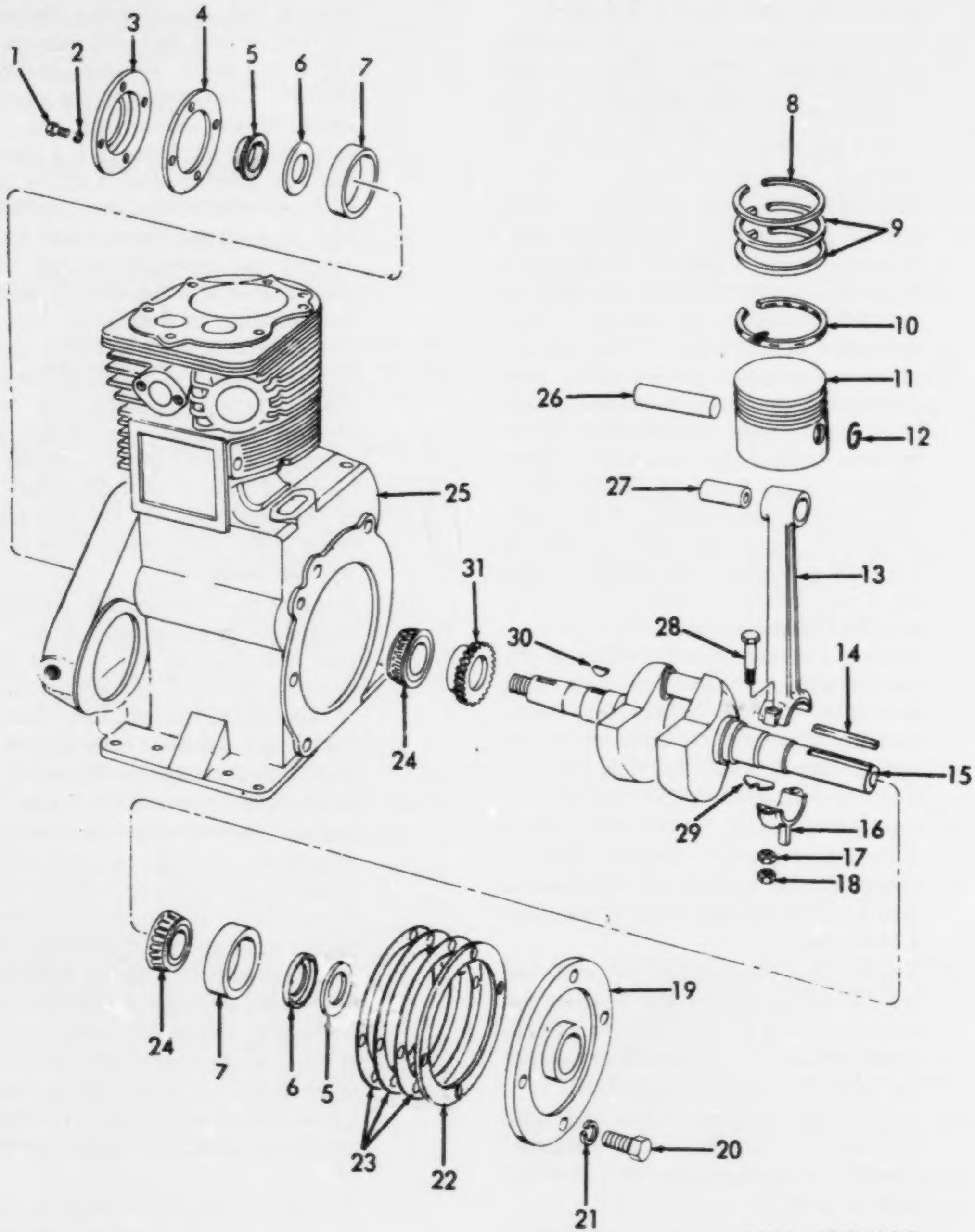
(10) Install the 2 shoulder bolts in the connecting rod. Position the rod cap on the connecting rod and secure with the 2 hex nuts, torqued to 18-foot-pounds. Then measure the inside diameter of the connecting rod assembly bearing surface. If the measurement is greater than 1.12900 inches, without using shims, the bearing surface is worn excessively and the connecting rod assembly should be replaced. Measure the overall length of the bearing to determine end play. The length should be 0.004 to 0.010 inch less than the length of the crankshaft journal between the journal shoulders. Reduce the length of an oversize connecting rod assembly bearing by filing or grinding both sides of the assembly. If the end play exceeds 0.010 inch, replace the connecting rod assembly.

(11) Inspect the crankshaft journal for roughness, scoring, and wear. Measure the journal for proper dimensions as specified in paragraph 4–32. If all measurements are favorable, polish the journal with corcus cloth and clean thoroughly. Replace a worn or defective crankshaft (para 4–33).

(12) Inspect the cylinder bore for cracks, roughness, scoring, or signs or wear. Measure the cylinder bore for proper dimensions. If the cylinder bore and piston wear are not excessive, new piston rings should perform satisfactorily. Rebore or hone a cylinder having a slightly rough or scored surface.

(13) If the cylinder bore will not clean up when bored or honed within the specified dimensions, the cylinder and crankcase assembly should be replaced.

(14) If a glazed condition exists in a cylinder bore which is otherwise not defective or worn, remove the glazed surface by passing a hone through the cylinder bore several times. Removal of the glaze will aid in better setting of piston rings.



MSC 4310-227-15/47

1 Bolt, machine, hex-hd, 5/16-18 × 3/4 in. (4 rqr)
2 Washer, lock, 5/16 in. (4 rqr)
3 Flywheel end plate
4 Gasket
5 Oil seal retainer
6 Gasket (2 rqr)

Figure 4-11. Piston, connecting rod, and crankshaft, exploded view.

7 Roller bearing cup (2 rqr)
8 Compression ring
9 Compression and scraper ring (2 rqr)
10 Oil ring
11 Piston
12 Retaining ring (2 rqr)
13 Connecting rod
14 Key, machine, 1/4 × 1/4 × 2 1/2 in.
15 Crankshaft
16 Rod cap
17 Nut, plain, hex, 5/16-24 (2 rqr)
18 Nut, stamped, 5/16-24 (2 rqr)
19 Drive pulley end plate
20 Screw, cap, hex-hd, 3/8-16 × 1 in. (4 rqr)
21 Washer, lock, 3/8 in. (4 rqr)
22 Gasket, 0.003 in.
23 Gasket, 0.006 in.
24 Cone and roller (2 rqr)
25 Cylinder and crankcase assembly
26 Piston pin
27 Sleeve bearing
28 Bolt, shoulder, 5/16 × 7/8 in. (2 rqr)
29 Connecting rod shim (2 rqr)
30 Key, woodruff, No. 6
31 Crankshaft gear

Figure 4-11—Continued.

Caution: **Thoroughly clean the cylinder and crankcase assembly after a reboring or honing operation to remove all foreign particles, then apply a light coat of clean lubricating oil to the cylinder bore.**

c. *Reassembly and Installation.*

(1) Press the sleeve bearing (27) into the connecting rod (13). Ream the inside diameter of the sleeve bearing 0.75050 to 0.75080 inch. Remove any sharp edges on the sides of the sleeve bearing.

(2) Apply a light film of clean lubricating oil on the piston pin (26). Install the piston pin partially into the piston (11), then install the connecting rod (13). Finish installing the piston pin through the sleeve bearing (27) in the connecting rod and the opposite side of the piston, and secure the piston pin at each end with a retaining ring (12).

(3) After the connecting rod is assembled to the piston, inspect for a bent or twisted rod on a suitable alinement fixture. If the connecting rod is twisted or bent it should be straightened or replaced.

(4) Using a piston ring expander tool, install new piston rings (8, 9 and 10) in the proper sequence on the piston (11). Install the oil ring (10) first, the two compression and scraper rings (9), then the top compression ring (8). Stagger the ring gaps so they are not in direct line with one another or the piston pin ends.

(5) Position the two shoulder bolts (28) in the connecting rod (13).

(6) Apply a light film of clean lubrication oil to the crankshaft journal, cylinder bore, piston, and connecting rod assembly bearing surfaces.

(7) Then install a piston ring compressor on the piston (11) and push the piston and connecting rod into the cylinder bore until the piston head leaves the piston ring compressor and reaches a point slightly below the top of the cylinder bore.

Caution: **Be sure to guide the connecting rod down through the cylinder bore to avoid damaging the crankshaft journal.**

(8) Turn the crankshaft throw to the bottom of its stroke, then push the piston all the way down until the connecting rod bearing surface seats on the crankshaft journal.

(9) Wipe the excess oil from the crankshaft journal and measure the fit of the connecting rod bearing on the crankshaft as follows:

(*a*) Place a length of plastic gage on the bearing surface of the rod cap (16).

(*b*) Install the 2 shims (29) and the rod cap (16) on the connecting rod (13) and secure with the 2 nuts (17). Torque the nuts to 16 to 18 foot-pounds.

Caution: **Do not turn the crankshaft while the plastic gage is being used.**

(*c*) Remove the two nuts and pull off the rod cap. Then compare the width of the flattened plastic gage, at its widest point, with graduations available on the envelope-type container for the plastic gage. The number within the graduation on the container indicates the bearing clearance. The clearance should be 0.0007 to 0.0002 inch.

(*d*) If the clearance indicated is greater than the required dimensions, repeat the measuring operation described in *a* through *c* above, without using the two shims (29) under the rod cap (16).

(*e*) If a slight amount of clearance is still indicated, the rod cap may be filed lightly on the mounting surfaces to obtain the proper fit. Replace the entire connecting rod assembly if the proper clearance cannot be obtained.

Note. Do not discard the two shims. In the event connecting rod assembly replacement is necessary, the shims may be needed to obtain the correct fit of the new assembly on the crankshaft.

(10) After the correct clearance is obtained, remove all traces of plastic gage material from the bearing surfaces and the crankshaft journal. Again coat the bearing surfaces and the crankshaft journal with a light film of clean lubricating oil and install the shims, if needed, and the rod cap as instructed in (9)(*b*) above.

(11) Install the 2 stamped nuts (18) that lock the 2 hex nuts (17) in position. Then rotate the crankshaft to be sure it turns freely.

(12) Install the cylinder head (para 3-70).

(13) Install the engine base (para 4-27).

Section IX. ENGINE CRANKSHAFT, CAMSHAFT, VALVE LIFTERS, AND GOVERNOR

4-32. General

The crankshaft is made of forged steel and is supported at each end by a tapered cone and rollers. The camshaft is driven by a helical gear on the crankshaft and rotates on a support pin through the center of the camshaft, which is secured in the crankcase at both ends. Cam lobes on the camshaft actuate the valve lifters and oil pump. A flyweight-type centrifugal governor at the end of the camshaft, opposite the camshaft gear controls the engine speed. Refer to TM 5-2805-203-14 for data applicable to model OEG-458-ENG-3.

4-33. Crankshaft and Bearings

a. Removal and Disassembly.

(1) Remove the piston and connecting rod assembly (para 4-31).

(2) Remove the air shroud (para 3-54).

(3) Remove the drive pulley (para 3-66).

(4) Remove the four capscrews (22, fig. 2-8) and the lockwashers (21) that secure the drive pulley end plate (20) to the cylinder and crankcase assembly (19) and remove the plate and four end plate gaskets (22 and 23, fig. 4-11) over the end of the crankshaft (15).

Note. The end plate gaskets are used to obtain correct crankshaft end play.

(5) Slowly rotate the crankshaft until the counterweights are clear of the camshaft gear (14, fig. 4-8). Then carefully remove the crankshaft (2) through the opening in the drive pulley end of the cylinder and crankcase assembly (7).

(6) Using a suitable puller, or an arbor press, carefully remove the cone and roller (24, fig. 4-11) from each end of the crankshaft (15).

(7) In a similar manner, remove the crankshaft gear (31) from the crankshaft; then remove the woodruff key

(30) from the keyway in the crankshaft.

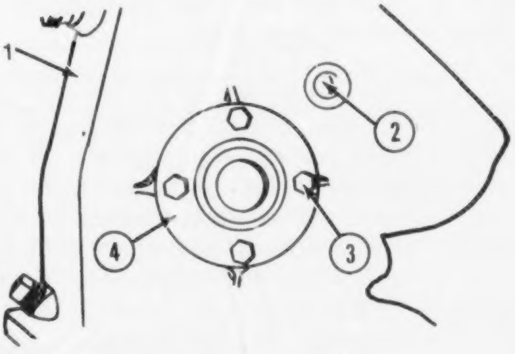
Note. The helical gear is keyed on the crankshaft. The gear should not be removed unless inspection indicates that it is damaged or worn and requires replacing (*b* (5) below).

(8) Remove the four bolts (3, fig. 4-12) and lockwashers that secure the flywheel end plate (4) to the cylinder and crankcase assembly (1). Remove the bearing plate and paper gasket (4, fig. 4-11).

(9) Using a suitable puller, remove the roller bearing cup (7) from the flywheel end of the cylinder and crankcase assembly. In a similar manner, remove the bearing cup from the drive pulley end plate (19).

(10) Use a blunt drift punch and hammer to remove the gasket (6) and oil seat retainer (5) from the flywheel end plate (3) and the drive pulley end plate (19).

Caution: **Since damage to the oil seal retainers is usually incurred during removal, the retainers and the gaskets should not be removed unless they are worn or damaged and are to be replaced (*b*(8) below).**



1 Cylinder and crankcase assembly
2 Expansion plug (2 rqr)
3 Bolt, machine hex-hd., 5/16-18 x 3/4 in. (4 rqr)
4 Flywheel end plate

Figure 4-12. Flywheel end plate, removal points.

b. Cleaning, Inspection, and Repair.

(1) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

(2) Place the crankshaft cone and rollers in a wire basket and lower the basket into a container of approved cleaning solvent. Rotate the wire basket several times until all oil sludge is loosened and flushed out of the cones.

(3) Remove the cone and rollers from the basket and allow to drain dry.

(4) After drying, inspect the cone and rollers and roller bearing cups for cracks, breaks, scoring, or signs of wear. Replace a defective cone and rollers and roller bearing cup.

Note. If the condition of a cone and rollers or roller bearing cup is questionable, replacement should be made immediately.

(5) Inspect the crankshaft helical gear for cracked, chipped, or broken teeth. Replace a worn or otherwise defective helical gear.

(6) Inspect the crankshaft for nicks, burrs, cracks, scoring, and wear. Examine the crankshaft journal for roughness and wear. Measure the length, diameter, and taper of the journal. Replace the crankshaft if the journal length is more than 1.2550 inches; diameter is less than 1.125 inches; out-of-round or taper exceeds 0.0005 inch; or the radius of a journal shoulder fillet is less than 0.125 inch. If all measurements read favorably, polish the journal with crocus cloth and clean thoroughly. The crankshaft should be metalized if inspection indicates the crankshaft journal wear exceeds the specified dimensions as in (7) below. The crankshaft alinement should be inspected before and after any grinding operations. Inspect the crankshaft for a runout in excess of 0.007 inch. Replace a defective or worn crankshaft.

(7) Metalizing and regrinding operations must be performed carefully and in strict compliance with the grinding

equipment manufacturer's instructions. Care must be taken to avoid localized heating to prevent grinding cracks. Use of grinding compound should be liberal during grinding operations. The reground journal should be polished absolutely smooth after grinding and the crankshaft should be carefully inspected to determine if any cracks or defects have developed either from heat or crowding of the grinding wheel during grinding operations.

(8) Inspect the gasket and oil seat retainers in the drive pulley end plate and the flywheel end plate for wear or damage. Replace defective or worn gaskets and oil seal retainers (*a* (9) above).

c. Reassembly and Installation.

(1) Install the gasket (6) and oil seal retainer (5) in the drive pulley end plate (19).

(2) Install the gasket (6) and oil seal retainer (5) in the flywheel end plate (3).

(3) Mount the drive pulley end plate (19) in an arbor press, with the inside machined surface facing upward, then install a roller bearing cup (7) with the thin side of the cup pointing upward. Press the roller bearing cup (7) with the thin side of the cup pointing upward. Press the bearing cup into the drive pulley end plate until the thin side of the bearing cup is flush level with the machined surface of the plate.

(4) Position the other roller bearing cup (7) at the bore in the flywheel end of the cylinder and crankcase assembly (25), with the thin side of the cup pointed inward, and drive the roller bearing cup into the bore until the outside edge of the bearing cup is flush level with the outer machined surface of the cylinder and crankcase assembly.

(5) Position the paper gasket (4) and the flywheel end plate (3) on the flywheel end of the cylinder and crankcase assembly (25) and secure with the four lockwashers (2) and bolts (1). Torque the capscrews to 22 to 26 foot-pounds.

(6) Install the woodruff key (30) in the keyway in the crankshaft (15).

(7) Position the crankshaft gear (31) on the flywheel end of the crankshaft, in line with the woodruff key, and press the gear in place with an arbor press.

***Caution:* Be sure the crankshaft is equally supported on all sides during pressing operations.**

(8) Lubricate the cone and rollers (24) with clean lubricating oil. Position cone and roller on the flywheel end of the crankshaft, with the cone taper outward, and press the cone and roller in place with an arbor press. Then install the other cone and roller on the drive pulley end of the crankshaft in a similar manner.

(9) Turn the camshaft gear (14, fig. 4-8) until the marked gear tooth is visible from inside the crankcase. Install the crankshaft (2), gear end first, from the drive pulley end of the cylinder and crankcase assembly and match the timing mark on the crankshaft gear with the timing mark on the camshaft gear.

(10) Position the bearing plate gaskets (22, and 23, fig. 4-11) on the drive pulley end plate (10), then slide the plate over the tapered end of the crankshaft (15) and secure to the cylinder and crankcase assembly (25) with the four lockwashers (21) and capscrews (20) torqued 22 to 26 foot-pounds.

***Caution:* The drive pulley end plate is stamped with the word TOP on the edge. Be sure that this marking faces toward the top of the cylinder and crankcase assembly when the plate is installed to insure adquate cone and roller lubrication.**

(11) Test for crankshaft end play with a dial indicator as follows:
  - (*a*) Push the installed crankshaft to the rear of the engine as far as possible.
  - (*b*) Position a dial indicator at the fly wheel end of the engine with the indicator plunger centered on the end of the crankshaft.
  - (*c*) Push or pull the crankshaft toward the dial indicator as far as it will move, then check the reading on the dial indicator. The reading should be 0.001 to 0.003 inch. Repeat this operation several times.
  - (*d*) If the end play is not within the specified measurement, remove the drive pulley end plate (19) and increase or decrease, as necessary, the number of end plate gaskets (22 and 23).
  - (*e*) Install the drive pulley end plate assembly and repeat the operation described in *a* through *d* above until the specified end play measurement is obtained.

(12) Install the air shroud (para 3-54).

(13) Install the drive pulley (para 3-66).

(14) Install the piston and connecting rod assembly (para 4-31).

4-34. Camshaft, Governor, and Valve Lifters

a. Removal and Disassembly.

(1) Remove the engine (para 3-61).

(2) Remove the valves (para 4-25).

(3) Remove the air shroud (para 3-54).

(4) Remove the fuel strainer-to-carburetor tube (para 3-34).

(5) Remove the governor control lever (para 3-39).

(6) Remove the crankshaft assembly (para 4-33).

(7) Remove the oil pump and the plunger rod and cap (para 4-28).

(8) Remove the two capscrews (24, fig. 2-8) that secure the support bracket (23) to the cylinder and crankcase assembly (19).

(9) Disengage the governor yoke (8, fig. 4-6) from the sleeve bearing (13) and remove the support bracket and governor yoke upward through the mounting recess in the cylinder and crankcase assembly (4). Then remove the gasket (7) from the cylinder and crankcase assembly.

(10) Separate the governor yoke from the support bracket.

(11) Using a sharp, pointed punch and a hammer, carefully remove the expansion plug (2, fig. 4-12) from the camshaft support pin bore in the flywheel side of the cylinder and crankcase assembly (1).

(12) Using a blunt drift punch and hammer, carefully drive the camshaft support pin (15, fig. 4-6) out through the opposite or drive pulley side of the cylinder and crankcase assembly (4). The expansion plug (14) in the rear pin bore will be forced out ahead of the camshaft support pin as the pin is driven out.

Caution: **Be extremely careful when driving the camshaft support pin out of the pin bores so as not to damage the support pin or bores.**

(13) When the camshaft support pin is completely removed, remove the drift punch and lift out the camshaft (12) with the camshaft gear (16), and governor assembly as a unit. Then remove the two valve lifters (18) from the guide holes inside the cylinder and crankcase assembly (4).

(14) Disassemble the governor assembly from the camshaft as follows:
  - (*a*) Remove the sleeve bearing (13) and the governor spacer (17) from the center of the two governor flyweights (10).
  - (*b*) Use a small drift punch and hammer to remove the spring pin (9) that secures the governor flyweight (10) to the camshaft (12) and remove the governor flyweight. Remove the other governor flyweight in a similar manner.

(15) To remove the camshaft gear (16) position the camshaft (12) in an arbor press, with the camshaft gear in the top position, supported evenly on all sides.

(16) Press the camshaft out of the camshaft gear; then remove the woodruff key (11) from the keyway in the camshaft.

Caution: **The camshaft gear must be supported evenly on all sides to avoid damage during removal of the camshaft.**

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect all camshaft, governor, and valve lifter components for excessive wear, cracks, and breaks.

(3) Inspect the sleeve bearing and governor spacer for a loose fit when assembled together. The sleeve bearing and governor spacer should also move freely on the camshaft support pin, but should not be excessively loose. Also inspect for excessive play between the governor yoke and the support bracket.

(4) Inspect the fit of the camshaft on the camshaft support pin. There should be no free play between the camshaft support pin and the camshaft.

(5) Inspect the camshaft gear for broken, burred, or excessively worn teeth.

(6) Measure the outside diameter of the camshaft support pin and the inside diameter of the camshaft and camshaft gear bores. Replace a camshaft support having a diameter of less than 0.4900 inch. Replace a camshaft and gear having an inside diameter in excess of 0.4930 inch.

(7) Inspect the camshaft lobes for scoring and signs of wear.

(8) Measure the valve lifters (18) for wear and clearance in the lifter guide holes. Replace a valve lifter having a diameter of less than 0.6230 inch. Clearance between the valve lifter and the guide hole, when the lifters are installed, should read 0.001 to 0.0025 inch. Inspect the flat area of the valve lifters which comes in contact with the camshaft lobes for excessive wear or scoring. Inspect the adjusting screws (19) for fit in the valve lifters. Replace loose lifting or worn valve lifters and adjusting screws.

(9) Replace all defective or worn components applicable to the camshaft, governor, and valve lifters.

c. Reassembly and Installation.

(1) Install the woodruff key (11) in the keyway in the camshaft (12).

(2) Use an arbor press to press the camshaft gear (16) on the camshaft. Have the marked side of the camshaft gear facing the camshaft lobes.

(3) Assemble the governor components to the camshaft as follows:

  (*a*) Aline the holes in one governor flyweight (10) with an applicable hole in the camshaft (12) and secure with a spring pin (9). In a similar manner, assemble the governor flyweight (10) to the camshaft.

  (*b*) Separate the two governor flyweights (10). Insert the governor spacer (17) into the end of the camshaft (12) and slide the sleeve bearing (13) over the governor spacer and down against the pins on the governor flyweights.

  (*c*) Close the governor flyweights between the two flanges on the sleeve bearing.

(4) Slide the two valve lifters (18) into the holes in the crankcase.

(5) Position the camshaft, with camshaft gear and governor assembly, in the crankcase lengthwise and in line with the camshaft support pin bores.

(6) Install the camshaft support pin (15), from the drive pulley end of the cylinder and crankcase assembly (4), through the rear camshaft pin bore and into the camshaft pin bore in the flywheel side of the cylinder and crankcase assembly.

(7) Use a blunt drift punch and a hammer to finally position the camshaft support pin, then install the two expansion plugs (14) in the pin bores to secure the camshaft support pin in place.

(8) Install the governor yoke (8) in the support bracket (6).

(9) Position the governor yoke gasket (7) on the cylinder and crankcase assembly; then install the governor yoke through the mounting recess. Engage the curved flange of the governor yoke with the sleeve bearing (13) on the camshaft (12).

(10) Secure the support bracket (6) to the cylinder and crankcase assembly with the two capscrews (5).

(11) Install the oil pump and the plunger rod and cap (para 3-82).

(12) Install the crankshaft assembly (para 3-37).

(13) Install the governor control lever (para 3-39).

(14) Install the fuel strainer - to - carburetor tube (para 3-34).

(15) Install the air shroud (para 3-54).

(16) Install the valves (para 4-25).

(17) Install the engine (para 3-61).

Section X. ENGINE CYLINDER AND CRANKCASE ASSEMBLY

4-35. General

The cylinder and crankcase assembly is the main structural component of the complete engine. This one-piece casting houses the crankshaft, camshaft, connecting rods, pistons, and oil pump. Machined surfaces are provided for mounting the cylinder head, bearing plates, magneto, and engine base. Refer to TM 5-2805-203-14 for data applicable to model OEG-458-ENG-3.

4-36. Cylinder and Crankcase Assembly

a. Removal and Disassembly.

(1) Remove the exhaust muffler and nipple (para 3-56).

(2) Remove the governor control assembly (para 3-39).

(3) Remove the magneto assembly (para 3-46).

(4) Remove the camshaft, governor, and valve lifters (para 4-34).

(5) Remove the roller bearing cup from the cylinder and crankcase assembly (para 4-33).

(6) Remove the crankcase oil filler plug (para 3-65).

b. Cleaning, Inspection, and Repair.

(1) Clean the cylinder and crankcase assembly in an approved cleaning solvent and dry thorougly. Remove all rust, loose paint, scale, and carbon deposits.

(2) Scrape all traces of gasket material from the machined surfaces and inspect for warpage, high-spots, nicks, and burrs that might interfere with proper fit of the attaching components and accessories.

(3) Inspect the cylinder and crankcase assembly for cracks, breaks, and other damage. Measure the diameter of the cylinder bore. Replace the cylinder and crankcase assembly if the diameter is in excess of 3.0005 inches, or if the cylinder taper or out-of-round exceeds 0.0005 inch.

(4) Inspect all threaded parts for damaged threads.

(5) Repaint as necessary. Retap all threaded holes where damaged threads appear. Replace a defective cylinder and crankcase assembly.

c. Reassembly and Installation.

(1) Install the camshaft, governor, and valve lifters (para 4-34).

(2) Install the roller bearing cup in the cylinder and crankcase assembly (para 4-33).

(3) Install the magneto assembly (para 3-46).

(4) Install the governor control assembly (para 3-39).

(5) Lubricate the engine in accordance with the lubrication order and install the oil filler plug (para 3-65).

(6) Install the exhaust muffler and nipple (para 3-56).

Section XI. COMPRESSOR ASSEMBLY REPAIR INSTRUCTIONS

4-37. General

The compressor assembly is an air-cooled, 2-stage, 2-cylinder, reciprocating piston, rotary compressor. There is one low and one high-pressure piston operating off the crankshaft. The crankshaft is supported at both ends by tapered roller bearings.

4-38. Cylinders, Pistons, and Connecting Rods

a. Removal and Disassembly.

(1) Remove the compressor assembly (para 3-62).

(2) Remove the access cover plate (para 3-77).

(3) Remove the intake and exhaust valves (para 3-82).

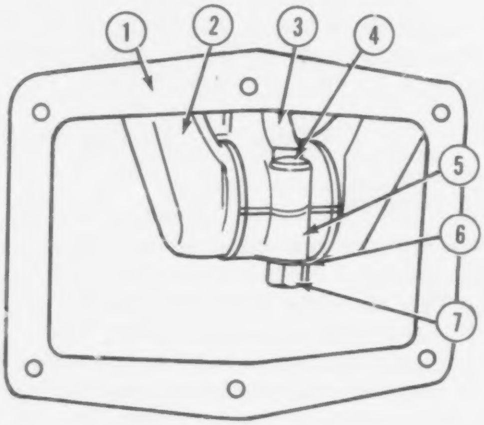
(4) Revolve the crankshaft (2, fig. 4-13) until the connecting rod screws (4) are accessible through the side of the crankcase (1).

(5) Remove the two screws (4), lockwashers (6), and nuts (7) that secure the connecting rod cap (5) to the low-pressure connecting rod (3) and remove the connecting rod cap and two shims (17, fig. 4-14).

Note. Match mark the connecting rod, cap, and shims to insure reassembly on the same connecting rod.

(6) Remove the low-pressure oil deflector (22) from the connecting rod cap (18).

(7) Remove the two screws (11), lockwashers (19), and nuts (20) that secure the connecting rod cap (18) to the high - pressure connecting rod (10). Remove the connecting rod cap, shims (17), and high-pressure oil deflector (21).



1 Crankcase
2 Crankshaft
3 Low-pressure connecting rod
4 Screw, cap, hex-hd, 3/8-24 x 2-1/8 in. (4 rqr)
5 Connecting rod cap (2 rqr)
6 Washer, lock 3/8 in. (4 rqr)
7 Nut, hex, 3/8-20 (4 rqr)

Figure 4-13. Piston and connecting rods, removal points.

(8) Remove the six nuts (11, fig. 3-29) that secure the cylinder (9) to the crankcase (21) and remove the assembled cylinder, pistons (7 and 24, fig. 4-14), the crankcase. Remove the cylinder gasket from the crankcase and discard the cylinder gasket.

(9) Place the cylinder on its side and pull each piston (7 and 24) out of the cylinder by means of the connecting rod.

(10) Remove the two retaining rings (1) that secure the low-pressure piston pin (2) in the low-pressure piston

(24). Drive out the low-pressure piston pin and remove the low-pressure connecting rod (23) from the low-pressure piston.

(11) Remove the two retaining rings (1) that secure the high-pressure piston pin (8) in the high-pressure piston (7). Drive out the high-pressure piston pin and remove the high-pressure connecting rod (10) from the high pressure piston.

(12) Press the sleeve bearings (9 and 25) from the connecting rods.

Note. Remove the sleeve bearings only if they need to be replaced.

(13) Remove the connecting rod bearings (12) from the connecting rod caps (18) and connecting rods (10 and 23).

Note. Match mark all parts to insure correct reassembly.

(14) Use a suitable ring expansion tool and start at the top piston ring on each of the pistons (7 and 24). Expand each of the piston rings (3, 4, 5, and 6) and work each ring from the ring land of the piston, moving up and over the top of the piston.

b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the cylinder for broken cooling fins and cracks. Replace a damaged cylinder.

(3) Inspect the cylinder bores for wear, scoring, pitting, or other damage. Inspect the bores, for out-of-round by placing an inside micrometer in the top of the cylinder bore and taking two measurements, 90° apart. Repeat the procedure halfway down the bore. The difference between the two measurements is the amount the bore is out-of-round. Replace or resize the cylinder if the bore is over 0.002 inch out-of-round.

(4) Measure the clearance of the piston pin in the piston pin bushing. Desired clearance is 0.002 to 0.009 inch. Maximum allowable wear or clearance is 0.001 inch.

(5) Inspect the connecting rods for any visible damage or misalinement. Realine slightly twisted rods or replace if they are badly damaged.

(6) Place the piston rings in the cylinder bore in which they will be used and measure the ring gap with a feeler gage. Position the piston ring square with the cylinder bore about one half inch from the top. The correct gap for the small compression and oil rings is 0.012, plus or minus 0.005 inch.

(7) If the ring gap is less than the specified, width, file across the butt ends of the ring to increase the gap to the required tolerance. If the ring gap is greater than 0.023 inch for any ring, replace the entire set of rings.

(8) Measure the ring groove in the pistons for wear and side clearance, using a feeler gage between the ring and groove side wall. The desired ring groove clearance is 0.0010 to 0.0025 inch for the low-pressure rings and 0.0010 to 0.0045 inch for the high-pressure rings.

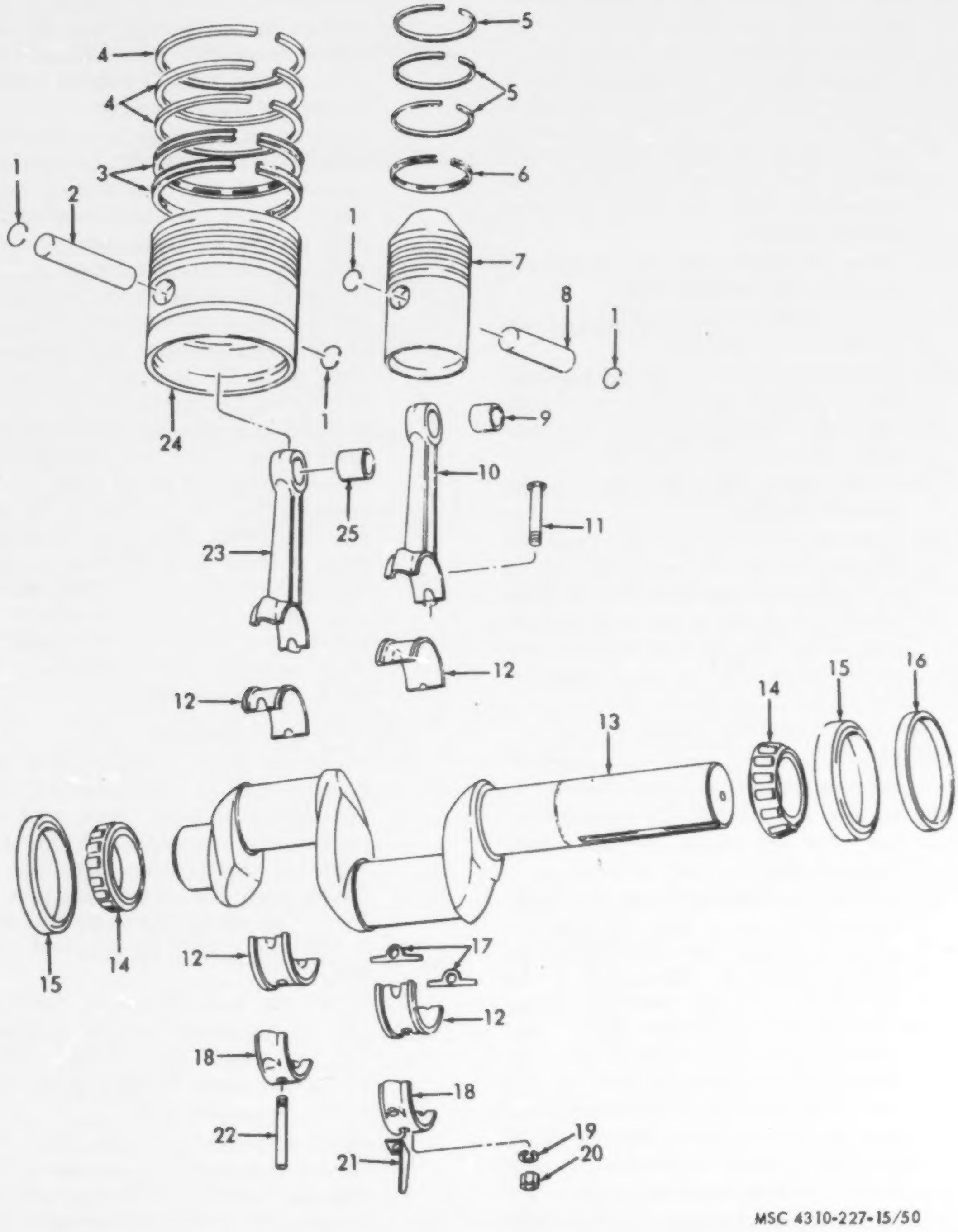
c. *Assembly and Installation.*

(1) Install the piston rings (3, 4, 5, and 6) in the grooves in the pistons (7 and 24). Use a suitable piston ring expansion tool to expand each ring and move it down over the top of the piston to the correct ring groove. Turn each piston ring so its ring gap is 180° away from the adjacent ring gap.

(2) Install the connecting rod bearings (12) in the connecting rods (10 and 23) and connecting rod caps (18).

(3) Install the sleeve bearing (9 and 25) in the connecting rods.

(4) Position the high-pressure piston (7) on the high-pressure connecting rod (10) and install the high-pressure piston pin (8) in the high-pressure piston. Drive the high-pressure piston pin through the sleeve bearing in the



MSC 4310-227-15/50

Figure 4-14. Pistons, connecting rods, and crankshaft, exploded view.

1 Retaining ring (4 rqr)
2 Low-pressure piston pin
3 Oil piston ring (2 rqr)
4 Compression piston ring (3 rqr)
5 Compression piston ring (3 rqr)
6 Oil piston ring
7 High-pressure piston
8 High-pressure piston pin
9 High-pressure sleeve bearing
10 High-pressure connecting rod
11 Screw, cap, hex-hd, 3/8–24 × 2 1/8 in. (4 rqr)
12 Connecting rod bearing (4 rqr)
13 Crankshaft
14 Tapered bearing cone and roller (2 rqr)
15 Bearing cup (2 rqr)
16 Oil seal
17 Shim (as rqr)
18 Connecting rod cap (2 rqr)
19 Washer, lock, 3/8 in. (4 rqr)
20 Nut, hex, 3/8–24 (4 rqr)
21 High-pressure oil deflector
22 Low-pressure oil deflector
23 Low-pressure connecting rod
24 Low-pressure piston
25 Low-pressure sleeve bearing

Figure 4-14—Continued.

connecting rod and lock the high-pressure piston pin in the high-pressure piston with the two retaining rings (1). Use a soft faced hammer when installing any of the four piston pins.

(5) Assemble the low-pressure piston (24), low-pressure connecting rod (23), low pressure piston pin (2) and the retaining rings (1) in the same manner as described in (2) through (4) above.

(6) Lubricate each piston and connecting rod assembly with a light coat of crankcase lubricant specified in the lubrication order. Use a suitable piston ring compressor and slide the assembled piston and connecting rod in the proper bore of the cylinder (9, fig. 3–29).

(7) Position a new cylinder gasket on the studs (10) in the crankcase (21) and install the assembled cylinder on the crankcase. Secure with the six nuts (11). Tighten to 45-foot-pound torque.

(8) With the crankshaft (13, fig. 4–14) turned at the proper angle for easy access, pull the connecting rods (10 and 23) down on the crankshaft.

(9) Install the low-pressure oil deflector (22) in the connecting rod cap (18) and install the connecting rod cap and 2 shims (17) on the low-pressure connecting rod. Secure with the 2 screws (11), lockwashers (19), and nuts (20). Tighten the nuts to 25 foot-pound torque.

(10) If the connecting rod is too loose, remove a shim and reassemble the cap and connecting rod. Proper cleanance is 0.0003 to 0.0016 inch.

(11) Install the high-pressure oil deflector (21), connecting rod cap (18), and shims (17) in a similar manner as described in (6) through (10) above.

(12) Install the intake and exhaust valves (par 3–82).

(13) Install the access cover plates (para 3–77).

(14) Install the compressor assembly (para 3–62).

4–39. Crankshaft, Bearings, and Oil Seal

a. Removal and Disassembly.

(1) Remove the centrifugal unloader (para 3–78).

(2) Remove the connecting rod caps (para 4–38).

(3) Remove the assembled crankshaft (2, fig. 4–13), out of the front of the crankcase (1).

(4) Place the crankshaft in a suitable press and remove the two tapered bearing cones and rollers (1, fig. 4–14) from the crankshaft (13).

(5) Remove the pipe plug from the rear of the crankcase and drive the bearing cup (15) and oil seal (16) out of the crankcase. Discard the oil seal.

Note. Remove the bearing cup only if it needs to be replaced.

(6) Remove the bearing cup (15) from the unloader body (16, fig. 3–29).

b. Cleaning, Inspection, and Repair.

(1) Clean all parts except the bearings with an approved cleaning solvent and dry thoroughly.

(2) Place the bearings in a wire basket, dip in an approved cleaning solvent and dry with low-pressure compressed air. Do not spin the rollers. Dip in light oil.

(3) Inspect the bearings for free and even rotation. Replace if defective.

(4) Inspect the crankshaft for cracks, scores, and distortion. Measure the crankshaft bearing journals for wear, using an outside micrometer. If the shaft measures more than 0.0005 out-of-round, metalize the crankshaft and turn down to correct size. The correct size for main bearing journals is 1.376 to 1.377 inches. The correct size for connecting rod journals is 1.375 to 1.376 inches.

(5) Inspect the bearing cups for scores, burrs, pits, or burned surfaces. Replace defective bearing cups.

c. Reassembly and Installation.

(1) Use a suitable bearing cup driver to press the bearing cup (15, fig. 4-14) and a new oil seal (16) in the crankcase (21, fig. 3-29). Install the remaining bearing cup in the unloader body (16) in the same manner.

(2) Install the pipe plug in the rear of the crankcase.

(3) Press the tapered bearing cones and rollers (14, fig. 4-14) on the crankshaft (13).

(4) Install the assembled crankshaft and tapered bearing cone and rollers in the crankcase, and install the connecting rod caps (para 4-38).

(5) Install the centrifugal unloader (para 3-78).

4-40. Crankcase

a. Removal.

(1) Remove the compressor assembly (para 3-62).

(2) Remove the access cover plates and oil sight indicator (para 3-77).

(3) Remove the cylinder, pistons, and connecting rods (para 4-38)

(4) Remove the crankshaft, bearings, and oil seal (para 4-39).

(5) Remove the six studs (10, fig. 3-29) from the top of the crankcase (21).

(6) Remove the pipe plug from the crankcase.

b. Cleaning, Inspection, and Repair.

(1) Clean the crankcase with live steam or an approved cleaning solvent and dry thoroughly.

(2) Inspect the studs and stud holes for damaged threads.

(3) Rechase damaged threads. Replace a damaged stud.

(4) Inspect the crankcase for cracks, breaks, or other damage. Replace a damaged crankcase.

c. Installation.

(1) Install the pipe plug in the crankcase.

(2) Install the six studs in the top of the crankcase.

(3) Install the crankshaft, bearings, and oil seal (para 4-39).

(4) Install the cylinder, pistons, and connecting rods (para 4-38).

(5) Install the access cover plates and oil sight indicator (para 3-77).

(6) Install the compressor assembly (para 3-62).

APPENDIX A

REFERENCES

A–1. Fire Protection

TB 5–4200–200–10	Hand Portable Fire Extinguisher for Army Use.

A–2. Lubrication

LO 5–2805–203–14	Engine, Gasoline: 6 HP; Military Standard Model 4A032–I and Model 4A032–II.
LO 5–4310–227–15	Compressor, Reciprocating; Air; Gasoline Engine; 15 CFM, 175 psi, w/Wisconsin Engine, Model MAENLD. Champion Pneumatic Machinery Company Models OEG–458–ENG–1 (Air receiver mtd), OEG–458–ENG–2 (Air Receiver mtd), OEG–458–ENG–3 Air Receiver mtd), w/Military Standard Engine Model 4A032–1), EMW–452–ENG (Trailer mtd), BMW–452–ENG–1 (Trailer mtd).

A–3. Preventive Maintenance

TM 9–6140–200–15	Operation and Organizational Field and Depot Maintenance: Storage Batteries, Lead-acid Type.
TM 38–750	Army Equipment Record Procedures.
TM 5–2805–203–24P	Organizational, DS and GS Maintenance Repair Parts and Special Tool Lists, Engine, Gasoline, Military Standard Models (Model 4A032–I FSN 2805–776–0483) (Model 4A-032–II FSN 2805–068–7512).
TM 5–2805–203–14	Operator, Organizational and Field Maintenance Manual, Engine, Gasoline: 6 HP; Military Standard Model 4A032–1. Serial Numbers G–000001 thru G–000500 and G–001001 thru G–004004 FSN 2805–776–0483.

A–4. Supply Publications

C–9100IL	Petroleum, Petroleum-Based Products and related Materials.

TM 5–4310–227–25P ---------------------- Operator, Organizational, Direct and General Support and Depot Maintenance Repair Parts and Special Tools Lists, Compressor, Reciprocating; Air; Gasoline Engine; 15 CFM, 175 psi; Receiver Mounted (Champion Pneumatic Model OEG–458–ENG–1) FSN 4310–861–9818, Receiver Mounted (Champion Pneumatic Model OEG–458–ENG–2) FSN 4310–075–5251, Receiver Mounted (Champion Pneumatic Model OEG–458–ENG–3) FSN 4310–965–1197, Base Mounted for Mounting on ORD Trailer; Winterized (Champion Pneumatic Model BMW–452–ENG) FSN 4310–861–9819, Base Mounted; Winterized (Champion Pneumatic Model BWM–452–ENG–1) FSN 4310–088–5342.

APPENDIX B

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the Air Compressor or are required for installation, operation, or operator's maintenance. Section II lists the accessories, tools, and publications required for the maintenance and operation by the operator, initially issued or authorized with the equipment. Section III lists the maintenance and operating supplies required for initial operation.

B-2. Explanation of Columns

The following provides an explanation of columns in the tabular list in Section II:

a. Source, Maintenance and Recoverability Codes (Column 1).

(1) Source code, column 1a, indicates the selection status and source for the listed item. Source codes are:

Code	Explanation
P	Applies to repair parts which are stocked in or supplied from the GSA/DSA Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization. If not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.

(2) Maintenance code, column 1b, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is —

Code	Explanation
O	Organization maintenance (operator/crew)

(3) Recoverability code, column 1c, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are —

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number for the item.

c. Description, Column 3. This column indicates the federal item name and any additional description required. A five-digit manufacturer's or other service code is shown in parentheses followed by the manufacturer's part number. Repair parts quantities included in kits, sets, and assemblies that differ from the actual quantity used in the specific item are listed in parentheses following the repair part name.

d. Unit of Issue, Column 4. This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit Pack, Column 5. This column indicates the actual quantity contained in the unit pack.

f. Quantity Incorporated in Unit, Column 6. This column indicates the quantity of the item used on the equipment.

g. Quantity Authorized, Column 7. This column indicates the total quantity of an item required to be on hand and necessary for operation and maintenance of the equipment. Items to be requisitioned as required as indicated by an asterisk.

h. Illustration, Column 8.

(1) Figure number, column 8a, indicates the figure number of the illustration in which the item is shown.

(2) Item or symbol number, column 8b, indicates the callout number used to reference the item in the illustration.

B-3. Explanation of Columns Contained in Section III.

a. Item. This column contains numerical sequence item numbers assigned to each component application to facilitate reference.

b. Component Application. This column identifies the component application of each maintenance or operating supply item.

c. Federal Stock Number. The Federal stock number will be shown in this column and will be used for requisitioning purposes.

d. Description. The item and a brief description are shown.

e. Quantity Required for Initial Operation. This column lists the quantity of each maintenance or operating supply item required for initial operation of the equipment.

f. Quantity Required for 8 Hours Operation. Quantities listed represent the estimated requirements for an average eight hours of operation.

B-4. Abbreviations

gal	gallon
in.	inch
lb	pound
lg	length
qt	quart
w	width

B-5. Federal Supply Codes

11568	Champion Pneumatic Machinery Co.
66289	Wisconsin Motor Corp.
94894	Milton Manufacturing Co., Inc.

Section II. BASIC ISSUE ITEMS LIST

(1) Source maint and recov code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) Qty auth	(8) Illustration	
(A) Source	(B) Maint	(C) Recov							(A) Fig No.	(B) Item or sym No.
				31—BASIC ISSUE ITEMS, MANUFACTURER INSTALLED						
				8100—BASIC ISSUE ITEMS, MANUFACTURER OR DEPOT INSTALLED						
P	O	--	6140-057-2554	BATTERY STORAGE, 2 V (2HN)						
				model BMW-452-ENG	--	--	1	1		
				Model BMW-452-ENG-1	--	--	2	2		
				(Repair Parts Manual Group 0612.)						
P	O	--	7520-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUALS: cotton duck, water repellent, mildew-resistant, MIL-B-11743B.			1	1		

(1) Source maint and recov code			(2) Federal stock number	(3) Description	(4) Unit of issue	(5) Qty inc in unit pack	(6) Qty inc in unit	(7) Qty auth	(8) Illustration	
(A) Source	(B) Maint	(C) Recov							(A) Fig No.	(B) Item or sym No.
P	O	--	4310-887-7865	CHUCK, AIR (Repair Parts Manual Group 5015.)	--	--	1	1		
				Department of the Army Lubrication Order, LO 5-2805-203-14	--	--	1	1		
				Department of the Army Lubrication Order, LO 5-4310-227-15	--	--	1	1		
				Department of the Army operator Organizational, DS and GS Maintenance Manual, TM 5-2805-203-14	--	--	1	1		
				Department of the Army Operator, Organizational, Field and Depot Maintenance Manual, TM 5-4310-227-15	--	--	1	1		
P	O	--	4210-270-4512	EXTINGUISHER, FIRE: carbon dioxide std charge 5 lb (Repair Parts Manual Group (7603.)	--	--	1	1		
P	O	--	4310-980-0135	HOSE ASSEMBLY AIR Model BMW-452-ENG Model BMW-452-ENG-1 (Repair Parts Manual Group 5015.)	--	--	1	1		
P	O	--	4310-874-3179	HOSE ASSEMBLY, AIR Model OEG-458-ENG-1 Model OEG-458-ENG-2 Model OEG-458-ENG-3 (Repair Parts Manual Group 5015.)	--	--	1	1		
P	O	--	4910-204-2644	INFLATOR-GAGE Model OEG-458-ENG-1 Model OEG-458-ENG-2 Model OEG-458-ENG-3	--	--	1	1		
P	O	--	2990-423-3779	ROPE, STARTER	--	--	1	1		
P	O	--	6810-264-9063	SUFPHURIC ACID, ELECTROLGTE						
				Model BMW-452-ENG	--	--	2	2		
				Model BMW-452-ENG-1	--	--	4	4		
P	O	--	2920-064-8835	LEAD, JUMPER			1	1		
				32—BASIC ISSUE ITEMS, TROOP INSTALLED						
				3200—BASIC ISSUE ITEMS, TROOP INSTALLED OR AUTHORIZED						
P	O	--	5120-277-9491	SCREWDRIVER, FLAT TIP: wood handle flared tip, 1/4 in. w, 4 in. lg blade	--	--	1	1		
P	O	--	5120-449-8033	WRENCH, OPEN END, ADJUSTABLE, 10 in lg	--	--	1	1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

Item	Component Application	Source of supply	Federal stock number	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
1	0101 CRANKCASE			OIL, LUBRICATING 1-qt can as follows:			(1) Includes quantity of oil to fill engine oil system as follows 1 1/2 qt crankcase 3/16 at air cleaner. (2) See C9100-SL for additional data and requisitioning procedure. (3) See current LO for Grade application and replenishment intervals. (4) Use oil as prescribed in (1) above. (5) Tank capacity (Model OEG-458) Tank capacity (Model BMW-452-ENG and BMW-452-ENG-1). (6) Average fuel consumption is .068 gal per hour of continuous operation. (7) Includes quantity of oil to fill compressor crankcase 2 1/4 qt.
			9150-264-9433(2)	OE-30	1 1/2 qt	(3)	
			9150-265-9425(2)	OE-10	1 1/2 qt	(3)	
			9150-242-7602(2)	OES	1 1/2 qt	(3)	
2	0304 AIR CLEANER	--	----------------	OIL, LUBRICATING (4)	3/16 qt	(3)	
3	0306 FUEL TANK (MODEL ENG-1, -2, -3).	--	9130-160-1818	FUEL, GASOLINE: automotive bulk.	2 3/4 gal (5)	5 1/2 gal (6)	
4	0306 FUEL TANK (MODEL BMW-452-ENG and BMW-452-ENG-1).	--	9130-160-1818	FUEL, GASOLINE: automotive bulk.	10 gal(5)	5 1/2 gal (6)	
				OIL, LUBRICATING 5-gal drum as follows:			
5	5001 CRANKCASE AIR COMPRESSOR		9150-231-6639(2)	2190	2 1/4 qt(7)	(3)	
			9150-223-4137(2)	2110	2 1/4 qt(7)	(3)	
			9150-225-5571(2)	2075	2 1/4 qt(7)	(3)	

APPENDIX C
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

a. Section I. This provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II. This designates overall responsibility for the performance of maintenance operations on the identified end item or component. The implementation of the maintenance tasks upon the end item or component will be consistent with the assigned maintenance operations.

c. No special tools and test equipment required.

d. Section III. This section contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II

a. Functional Group Number. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1 Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature. This column contains a brief description of the components of each functional group.

c. Maintenance Operations and Maintenance Levels. This column lists the various maintenance operations ("A" through "J") and indicates the lowest maintenance level authorized to perform these operations.

(1) The symbol designations for the varrious maintenance levels are as follows:

O/C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

(2) The Maintenance Operations are defined as follows —

(*a*) *A—Service.* Operations required periodically to keep the item in proper operating condition, i. e., to clean, preserve, drain, paint, and replenish fuel, lubricants, hydraulic, and deicing fluids, or compressed air supplies.

(*b*) *B—Adjust.* Regulate periodically to prevent malfunction. Adjustments will be made commensurate with adjustment procedures and associated equipment specifications.

(*c*) *C—Aline.* Adjust two or more components of an electrical or mechanical system so that their functions are properly synchronized or adjusted.

(*d*) *D—Calibrate.* Determine, check, or rectify the graduation of an instrument, weapon, or weapons system or components of a weapons system.

(*e*) *E—Inspect.* Verify serviceability and detect incipient electrical or mechanical failure by close visual examination.

(*f*) *F—Test.* Verify serviceability and detect incipient electrical or mechanical failure by measuring the mechanical or electrical characteristics of the item and comparing those characteristics with authorized standards. Tests will be made commensurate with test procedures and with calibrated tools and/or test equipment referenced in the MAC.

(*g*) *G—Replace.* Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts or remove and install the same item when required for the performance of other maintenance operations.

(*h*) *H—Repair.* Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills—to include welding, grinding, riveting, straightening, adjusting and facing.

(*i*) *I—Overhaul.* Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and published by the commodity commands) by employing techniques of "Inspect and Repair Only as Necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.

(*j*) *J—Rebuild.* Restore to a condition comparable to new by disassembling to determine the condition comparable to new by disassembling to determine the condition of each component part and reassembling using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

d. Reference Note. This column, subdivided into columns "K" and "L", is provided for referencing the REMARKS (Sec. III) that may be associated with maintenance operations (Sec. II).

C-3. Explanation of Columns in Section III

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to section II. The first letter references column L and the second letter references a maintenance operation, columns A through J.

b. Remarks. This column lists information pertinent to the Maintenance Operation being performed, as indicated on the Maintenance Allocation Chart (sec. II).

Section II. MAINTENANCE ALLOCATION CHART

Functional group number	Component assembly nomenclature	Essentiality	Maintenance and operations									Levels	Note ref	
			A	B	C	D	E	F	G	H	I	J	K	L
			Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE RQMT	Remarks
01	ENGINE													
0100	Engine Assembly:													
	Engine, gasoline	--	O/C	----	--	--	O/C	O	O	O	H	--	--	A
0101	Crankcase, Block, Cylinder Head:													
	Cylinder and crankcase assembly	--	----	----	--	--	----	--	H					
	Head, cylinder	--	----	----	--	--	----	--	O	O	--	--	--	B

Functional group number	Component assembly nomenclature	Essentiality	Maintenance and operations										Note ref	
											Levels			
			A	B	C	D	E	F	G	H	I	J	K	L
			Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE RQMT	Remarks
0102	Crankshaft:													
	Crankshaft	--	----	----	--	--	----	--	H					
	Bearings; seals	--	----	----	--	--	----	--	H					
	Pulley	--	----	----	--	--	----	--	O					
0103	Flywheel Assembly:													
	Flywheel	--	----	----	--	--	----	--	O					
	Ring gear	--	----	----	--	--	----	--	F					
0104	Pistons, Connecting Rods:													
	Piston assembly	--	----	----	--	--	----	--	F					
	Rod assembly connecting	--	----	----	--	--	----	--	F	F				
	Rings; piston pin	--	----	----	--	--	----	--	F					
0105	Valves, Camshaft and Timing System:													
	Valves	--	----	----	--	--	----	--	F	F	--	--	--	C
	Inserts, valve seat	--	----	----	--	--	----	--	F	F				
	Lifter, valve	--	----	----	O	--	----	--	F					
	Cover, valve	--	----	----	--	--	----	--	O					
	Arm Assembly Rocker	--	----	O	--	--	----	--	O					
	Push rods and housing	--	----	----	--	--	----	--	O					
	Packing, push rods and housing	--	----	----	--	--	----	--	O					
	Guides and springs	--	----	----	--	--	----	--	F					
	Camshaft	--	----	----	--	--	----	--	F					
	Gears, timing	--	----	----	--	--	----	--	F					
	Thrust plate; ball; spring	--	----	----	--	--	----	--	F					
0106	Engine Lubrication System:													
	Base, engine	--	----	----	--	--	----	--	F					
	Body assembly, oil pump	--	----	----	--	--	----	--	F	F				
	Gears and plate, oil pump	--	----	----	--	--	----	--	O					
	Carburetor	--	----	O	--	--	----	--	O					
0302	Fuel Pumps:													
	Pump, fuel	--	----	----	--	--	----	--	O					
0304	Air Cleaner:													
	Air cleaner	--	O/C	----	--	--	----	--	O					
0306	Tanks, Lines, Fittings:													
	Cap, fuel, tank	--	----	----	--	--	----	--	O					
	Lines; fittings; hose	--	----	----	--	--	----	--	O					
0308	Engine Speed Governor and Controls:													
	Tank	--	O/C	----	--	--	----	--	O	O				
	Governor assembly	--	----	----	--	--	----	--	O	F				
	Rod control	--	----	----	--	--	----	--	O					
0309	Fuel Filters:													
	Filter	--	O/C	----	--	--	----	--	O					
	Strainer	--	O/C	----	--	--	----	--	O					

Functional group number	Component assembly nomenclature	Essentiality	Maintenance and operations A Service	B Adjust	C Aline	D Calibrate	E Inspect	F Test	G Replace	H Repair	I Overhaul	Levels J Rebuild	Note ref K T&TE RQMT	L Remarks
0312	Throttle or Choke Control:													
	Choke assembly	--	--	--	--	--	--	--	O					
	Throttle device	--	--	O	--	--	--	--	O					
	Idle control	--	--	O	--	--	--	--	O					
04	EXHAUST SYSTEM													
0401	Muffler:													
	Muffler	--	--	--	--	--	--	--	O					
	Weathershield	--	--	--	--	--	--	--	O					
	Rain cap	--	--	--	--	--	--	--	O					
05	COOLING SYSTEM													
0502	Cowling, Deflectors, Shrouds:													
	Shroud, flywheel	--	--	--	--	--	--	--	O					
	Cover, air shroud	--	--	--	--	--	--	--	O					
	Screen	--	--	--	--	--	--	--	O					
06	ELECTRICAL SYSTEM													
0601	Generator:													
	Generator	--	O/C	--	--	--	--	--	O	F				
	Brushes	--	--	--	--	--	--	--	O					
	Belt	--	--	O/C	--	--	--	--	O					
0620	Generator Regulator:													
	Regulator	--	--	--	--	--	--	O	O					
	Mount, shock	--	--	--	--	--	--	--	O					
0603	Starting Motor:													
	Motor, starting	--	O/C	--	--	--	--	--	O	F				
	Brushes	--	--	--	--	--	--	--	O					
0605	Ignition Components:													
	Magneto	--	O/C	O	--	--	--	--	O	F				
	Points; condenser	--	--	--	--	--	--	--	O					
	Cable; leads	--	--	--	--	--	--	--	O					
	Spark plugs	--	--	O	--	--	--	O	O					
0606	Engine Safety Controls:													
	Switch, Hi-temperature	--	--	--	--	--	--	--	O					
0607	Instrument or engine Control Panel:													
	Ammeter	--	--	--	--	--	--	--	O					
	Gage, fuel	--	--	--	--	--	--	--	O					
	Switches	--	--	--	--	--	--	--	O					
	Meter, time totalizing	--	--	--	--	--	--	--	O					
	Panel	--	--	--	--	--	--	--	F					
	Starter button	--	--	--	--	--	--	--	O					
	Leads, electrical	--	--	--	--	--	--	--	O					
0612	Batteries:													
	Batteries	--	O/C	--	--	--	--	O	O					
	Cables	--	--	--	--	--	--	--	O					
	Frame, battery holddown	--	--	--	--	--	--	--	O					
0615	Radio Interference Suppression:													
	Capacitor	--	--	--	--	--	--	O	O					
	Ground strap	--	--	--	--	--	--	--	O					

Functional group number	Component assembly nomenclature	Essentiality	Maintenance and operations							Levels			Note ref	
			A	B	C	D	E	F	G	H	I	J	K	L
			Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE RQMT	Remarks
15	FRAME													
1501	Frame Assembly:													
	Base	--	----	----	--	--	----	--	F					
	Mount, flex	--	----	----	--	--	----	--	F					
	Rail assembly	--	----	----	--	--	----	--	F					
18	BODY, CAB, HOOD AND HULL													
1808	Boxes:													
	Box, tool	--	----	----	--	--	----	--	O	O				
22	ACCESSORY ITEMS													
2201	Canvas Items:													
	Canvas cover	--	----	----	--	--	----	--	O	O				
2202	Accessory Items:													
	Valve	--	----	----	--	--	----	--	O					
	Hose	--	----	----	--	--	----	--	O					
	Gage, tire inflation	--	----	----	--	--	----	--	O					
2207	Winterization Equipment:													
	Enclosure assembly	--	----	----	--	--	----	--	O	O				
	Louver assembly	--	----	----	--	--	----	--	O					
	Preheater	--	----	----	--	--	----	--	O					
	Hose	--	----	----	--	--	----	--	O					
	Shroud assembly	--	----	----	--	--	----	--	O					
2210	Data Plates and Instructions Holders:													
	Data, Plates	--	----	----	--	--	----	--	F					
	Plates, instruction	--	----	----	--	--	----	--	O					
47	GAGES													
4702	Gages, Lines and Fittings:													
	Gage, oil	--	----	----	--	--	----	--	O					
	Tube, oil	--	----	----	--	--	----	--	O					
	Gage, pressure	--	----	----	--	--	----	--	O					
50	PNEUMATIC EQUIPMENT													
5000	Air compressor assembly:													
	Compressor, air	--	O/C	----	--	--	O/C	--	O	F	H			
5001	Crankcase:													
	Crankcase	--	----	----	--	--	----	--	F					
	Cylinder, air	--	----	----	--	--	----	--	F					
	Cover plate, access	--	----	----	--	--	----	--	O					
	Window, observation, oil level	--	----	----	--	--	----	--	F					
5002	Crankshaft:													
	Cone; rollers	--	----	----	--	--	----	--	F					
	Crankshaft	--	----	----	--	--	----	--	F					
	Seals	--	----	----	--	--	----	--	F					
5004	Pistons, Connecting Rods:													
	Piston assembly	--	----	----	--	--	----	--	F					
	Rod assembly	--	----	----	--	--	----	--	F	F				
	Ring set, piston	--	----	----	--	--	----	--	F					

Functional group number	Component assembly nomenclature	Essentiality	Maintenance and operations A Service	B Adjust	C Aline	D Calibrate	E Inspect	F Test	G Replace	Levels H Repair	I Overhaul	J Rebuild	Note ref K T&TE RQMT	L Remarks
5005	Valves:													
	Valve seat	--	----	----	--	--	----	--	O					
	Disk, valve	--	----	----	--	--	----	--	O					
	Housing, valve	--	----	----	--	--	----	--	O					
	Spring valve	--	----	----	--	--	----	--	O					
	Gasket	--	----	----	--	--	----	--	O					
5006	Lubrication System:													
	Tube assembly, breather	--	----	----	--	--	----	--	O					
	Fittings	--	----	----	--	--	----	--	O					
5007	Compressor Drive:													
	Belts	--	----	O	--	--	----	--	O					
	Guard	--	----	----	--	--	----	--	O					
	Flywheel	--	----	----	--	--	----	--	O					
	Bushing	--	----	----	--	--	----	--	O					
	Sheave	--	----	----	--	--	----	--	O					
5008	Air Intake:													
	Manifolds	--	----	----	--	--	----	--	O					
	Tubes	--	----	----	--	--	----	--	O					
	Valve	--	----	----	--	--	----	--	O					
	Filter	--	----	----	--	--	----	--	O	O				
5009	Unloader System Components:													
	Valve, check	--	----	----	--	--	----	--	O	O				
	Lines; fittings	--	----	----	--	--	----	--	O					
	Relief valve	--	----	----	--	--	----	--	O					
	Safety valve	--	----	----	--	--	----	--	O					
	Centrifugal unloader	--	----	----	--	--	----	--	O	F				
5010	Compressor Cooling:													
	Tube, intercooler and after cooler	--	----	----	--	--	----	--	O					
5014	Air Receiver:													
	Tank	--	----	----	--	--	----	--	O					
	Drain cock	--	----	----	--	--	----	--	O					
5015	Air discharge System:													
	Manifolds	--	----	----	--	--	----	--	O					
	Valves	--	----	----	--	--	----	--	O					
	Fittings	--	----	----	--	--	----	--	O					

Section III. MAINTENANCE FUNCTIONS

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A—F	Operational test and compression.
B—H	Refacing valve seats.
C—H	Refacing valves.

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By Order of the Secretary of the Army:

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For explanation of abbreviations used, see AR 320-50.

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